

INTERNATIONAL CONFERENCE ON ENGINEERING, SCIENCE, AND TECHNOLOGY

THEME: UTILIZING THE KNOWLEDGE OF
ENGINEERING, SCIENCE, AND TECHNOLOGY
FOR SUSTAINABLE DEVELOPMENT

**CONFERENCE PROGRAMME OF EVENTS &
BOOK OF ABSTRACTS**

DATE: 23RD TO 25TH NOVEMBER, 2023
VENUE: SHELL BUILDING, UNIVERSITY OF
CROSS RIVER STATE, NIGERIA

UNIVERSITY OF CROSS RIVER STATE,
CALABAR, NIGERIA



FACULTY OF ENGINEERING
PRESENTS

2023 ICEST CONFERENCE

International Conference on
Engineering, Science & Technology
for Sustainable Development

SUB-THEMES

- Engineering for Agricultural Development, Food Availability, Accessibility & Affordability for Economic Sustainability.
- Engineering Innovation & Development for Economic Sustainability.
- Engineering Wood and its Products for Sustainable Development.
- Wood Utilization, Pulp and Paper Technology for Sustainable Development.
- Sustainable Infrastructure Development for Economic Sustainability.
- Flood, Soil Erosion and Water Quality Management for Economic Sustainability.
- Sustainable infrastructure & environmental development, Transportation & mobility, Engineering Education & Management, Infrastructure Resilience & Protection.
- Sustainable Materials for Green Economy – Composite materials, Nano-materials, electronic, magnetic, structural materials etc.
- Product Innovation for Green Economy – computational design & engineering, artificial intelligence & machine learning, mechatronics etc
- Energy Transitioning for Green Economy – energy mix & transitioning, low carbon & renewable energy technology, carbon capture technologies, clean fuels, energy security etc.
- Power & Control System Engineering for Sustainable Development.
- ICT, IOT & AI for sustainable development.
- Power and Machinery Development for Sustainable Economy.

PAYMENT TO FACULTY OF ENGINEERING ACCOUNT

Bank: Union Bank
Name: Cross River University of
Technology, Faculty of Engineering
Account Number: 0192138254
Sort code: To be filled by you after
payment

ORGANIZING COMMITTEE

Chairman: Engr. Dr. Simon Ogbeche Odey - 07034575615
Secretary: Engr. Paul Anyin - 07066870700
Technical Sec: Engr. Dr. Samuel Oliver Effiom - 08166170895

ACTIVITIES

- Planning and Technical sessions/panel discussions
- Exhibitions and Excursions/Technical tours
- Cocktail, Special Awards Communique

REGISTRATION

Early bird: 15th June-31st August, 2023 -
N30,000.00
Late Registration: 1st Sept-20th Oct, 2023 -
N35,000.00
Reg. at Conference venue: 25th Oct, 2023 -
N45,000.00
Postgraduate Student Registration: N25,000.00
Undergraduate Student Registration: N10,000.00
Foreign Participants: \$100, foreign delegates
requiring visa visit; <https://immigratio.gov.ng/visas/>

IMPORTANT DATES

Lifeline for submission of Abstracts: 31st July, 2023.
Acceptance of Abstracts: 15th August, 2023
Lifeline for submission of full paper: 30th August, 2023

NOTE:

Please kindly submit your paper(s) and register through the link <http://bit.ly/ICEST2023> Or scan the QR code.

Papers can also be submitted to:
icest@unicross.edu.ng





PROF. AUGUSTINE OKO ANGBA

Vice Chancellor, University of Cross River
State, Nigeria

CHIEF HOST



ENGR. PROF. EKO JAMES AKPAMA

Dean, Faculty of Engineering

University of Cross River State, Nigeria

Host



ENGR. DR. SIMON OGBECHE ODEY

Sub Dean, Faculty of Engineering

Chairman, ICEST 2023 Organizing
Committee

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Engr. Dr. Jerome Egbe	—	Member

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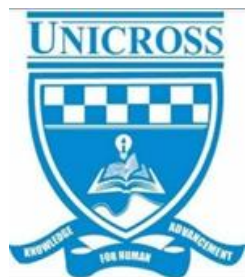
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Engr. Gitu Bassey	—	Member
Engr. Emmanuel Odu	—	Member
Finance Committee		
Dean (Faculty of Engineering)		

HOD of Civil, Mechanical, Elect/Elect, & Wood Product Engineering

Media/Publicity Committee

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Dr. Ofut Ogar	—	Member
Engr. Dr. Ibiang Ibiang	—	Member
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Joshua Inyang		
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Anyanwu Goodluck		
Offah Enagu Okorn		
Sarah Clement Isoh		
Egbe Ojong Tandu		
Noah Aniah		

OUR SPONSORS



CONFERENCE VENUE DESCRIPTION

To locate the Shell Building, University of Cross River State (UNICROSS) in Calabar from Margaret Ekpo International Airport, you can follow these general directions:

1. **Taxi or Car Rental:** Upon arriving at Margaret Ekpo International Airport, you can hire a taxi from the airport terminal. Most taxis are readily available at the airport and can take you to your destination.
2. **Travel Route:** From the airport, travel southwest towards Calabar city center. The University of Cross River State is situated in Calabar, the capital city of Cross River State.
3. **Use Navigation Apps or Maps:** Utilize navigation apps like Google Maps or Waze by entering the destination address or the name of the University of Cross River State (UNICROSS) in Calabar. These apps will provide you with real-time directions and the best route to reach the university from the airport.
4. **Distance and Time:** The distance and travel time from Margaret Ekpo International Airport to UNICROSS in Calabar may vary depending on traffic conditions, but it generally takes approximately 20-40 minutes by car, covering a distance of about 10-20 kilometers, depending on the specific location of the university within the city.
5. **Local Assistance:** If needed, you can ask for directions or assistance from airport staff, taxi drivers, or locals to guide you towards the University of Cross River State in Calabar. They might provide helpful information about the best routes or landmarks to navigate to the university.

Always ensure to confirm the address and location of the University of Cross River State beforehand and use reliable transportation methods to reach your destination safely and efficiently.

MAP TO UNICROSS

You can easily find the University of Cross River State (UNICROSS) in Calabar using online mapping services such as Google Maps, Apple Maps, or other GPS navigation applications.

To locate UNICROSS on a map:

1. Open a mapping application on your smartphone, tablet, or computer. Google Maps is a popular choice.
2. In the search bar, type "University of Cross River State, Calabar" or enter the specific address if available. The university might also be recognized under its former name, "Cross River State University of Technology (CRUTECH)."
3. The map application will display the location of UNICROSS in Calabar, showing you the exact placement within the city and nearby landmarks or roads.

This method will provide you with a detailed map and directions to reach the University of Cross River State (UNICROSS) from your current location. You can use the map features to zoom in, explore nearby streets, and plan your route accordingly.

MAP SHOWING VARIOUS VENUES



INVITED KEYNOTE SPEAKER

BRIEF PROFILE OF ENGR. PROF. EZENDU ARIWA



Professor Ezendu Ariwa holds the position of Professor in Computer Science at University of Bedfordshire, United Kingdom, Department of Computer Science & Technology, with speciality in Practice in Computing. He is also a Visiting Professor at Gulf University, Bahrain, Visiting Professor in Engineering Sustainability and ICT, Anadolu University, Turkey, Visiting Professor, University of Lagos, Nigeria, Visiting Professor and Co-Director of the Centre of Excellence in Cloud Computing, IAMTECH University, Sierra Leone and Visiting Professor, Kano State Polytechnics, Nigeria as well as Visiting Affiliate of the Green IT Observatory, RIMT University, Australia and Visiting Affiliate of ICT University, USA. He also holds the position of Director – Technical and Non-Executive Director and Research Professor for Enterprise Projects at Sun Bio IT Solutions Pvt. Ltd, India.

He is also the Chair for the IEEE Consumer Electronics Chapter, United Kingdom & Ireland (UK&I), Chair for the IEEE Broadcast Technology Chapter, UK&I and Chair for the IEEE Technology Management Council Chapter, UK&I. He is a Senior Member of Institute of Electrical & Electronic Engineers (SMIEE); Chartered FELLOW of the British Computer Society (CITP, FBCS), Fellow of the Institute of Information Technology Training (FIITT), Fellow of Institute of Leadership and Management (FInstLM), Fellow of the Higher Education Academy (FHEA) and Fellow of the Royal Society of Arts (FRSA). He is also a member of the Elite Group of The British Computer Society (BCS), member of British Institute of Facilities Management and Fellow of Global Strategic Management, Inc., Michigan, USA and Member of the UK Council for Health Informatics. He has experience of doctoral research supervision as well as doctoral external examiner for various Universities both in the UK and internationally.

He has a good research profile and the Founding Editor-in-Chief of the International Journal of Green Computing (IJGC), Editor-in-Chief of the International Journal of Computing and Digital Systems (IJCDs), Journal of E-Technology, and the Associate Editor of the International Journal of E-Politics and the Associate Editor of International Journal of Distributed Systems and Technologies (IJDST). He is a member of Policy Co-ordination Committee of the International Research Foundation for Development (A Corporation of NGO in special Consultative status with the Economic and Social Council of the United Nations). Professor Ezendu Ariwa is author of a number of books and more than 100 papers published in international journals and conference proceedings. He has also delivered keynote speeches at various international conferences.

He recently published three books: Green Technology Applications for Enterprise and Academic Innovation (ISBN13: 9781466651661, IGI publisher, USA); Africa Business, Sustainability and Technology Innovation Practices, (ISBN 978-605-86159-9-1), MacroWorld Publishers); Green Technology in E-Learning and Human Capital: Global Perspectives. MacroWorld Publisher, 2016 (ISBN : 978-605-86159-8-4)

INVITED GUEST SPEAKERS

BRIEF PROFILE OF DR. BURHAN SAEED



Dr. Burhan Saeed is a seasoned Lecturer of Mechanical and Aerospace Engineering, currently teaching at Imperial College London (ICL). Before joining the department of Aeronautics at ICL, he has worked as a Lecturer at the University of Portsmouth, and as a panel tutor at University of Cambridge, and also a Research Lead at the Centre for Alternative Technology – Mid Wales, University of Leeds, University of Bath, and Brunel University London.

Dr. Saeed's education span across Brunel University London (PhD in Aeronautical Engineering), Cranfield University (Thermal Power MSc in Aerospace Propulsion), University of Bristol (MSc in Advanced Dynamics Engineering), University of Manchester (BEng in Aeronautical & Astronautical Engineering). He is also an accomplished researcher, with a significant research track record and research collaborations with Academics in the UK, Europe, USA, Nigeria, and China.

A parallel to thriving engineering research, Dr. Saeed has tutored undergraduates and coordinated/supervised postgraduates in their group and individual projects.

As an Academic, he has delivered lectures, tutorials, and led laboratory experiments in various aero-mechanical subjects including aerodynamics, thermos-fluids, solid mechanics, aircraft design, clean aviation fuels, and renewable energies. For the past 16 years, he has been involved in supporting young engineers realize their potentials and career prospects. He is a fellow of the Higher Education Academy (FHEA).

BRIEF PROFILE OF ENGR. PROF. AKINDELE FOLARIN ALONGE



Professor Akindele Folarin Alonge is a distinguished academic and Dean at the University of Uyo, Nigeria, specializing in Agricultural and Food Engineering. Holding a Ph.D. in Agricultural Engineering from the University of Ilorin, his focus on solar drying, renewable energy, and climate change has shaped his extensive research. His work extends to various areas including biological materials' engineering, oil extraction, agricultural produce storage, and crop processing machinery development. Presently, he delves into Zobo tea production, food safety, quality, and Artificial Intelligence applications.

A strong advocate for continuous learning, Alonge attended numerous academic and professional courses globally, enriching his teaching, research, and community service capacities. His scholarly impact is evident through over 140 publications and 40 presentations worldwide.

His professional affiliations include being a registered Engineer with COREN, a longstanding 19-year membership with ASABE, and participation in committees like CAFEI's International Advisory Committee. He's held positions as a Visiting Scholar at Virginia Polytechnics and State University, and a Visiting Professor at McGill University, among others.

A respected figure in various engineering institutions, he holds roles such as Chairman of NIAE's NEC, coordinates the Nigerian Food Engineering Forum, and is a permanent Senate member at the University of Uyo. Besides his career, he finds joy in family life, being happily married with a daughter, Catherine Modupe Alonge, who works as a University Administrator.

BRIEF PROFILE OF DR. OSI CHUKWUMA



Osi is a multifaceted professional, serving as CEO and Director of Tungsten Energy Ltd in the UK and Nigeria, a renewable energy company leading initiatives in hydrogen electrolysis and advocating for renewable energy adoption across industries in Nigeria. Simultaneously, as the Chief Executive of DGS Technologies (UK) since 2013, he's significantly improved operational performance, securing contracts with major companies like British Petroleum, BAT, and Coca-Cola's Costa Coffee for IT and Big Data solutions.

With a PhD in Big Data Analytics and extensive experience in enterprise IT and infrastructure solutions in the UK and Nigeria, Osi is certified in various project management methodologies and a member of the Project Management Institute. Over 25 years, he's spearheaded portfolio management for FTSE 100 & 250 companies, engaging with C-Suite executives to formulate organizational strategies and operational models.

Beyond his professional commitments, Osi passionately engages in community service, mentoring young individuals in Nigeria and the UK. He organizes an annual IT conference aiding minorities in accessing professional employment and operates a charity funding education for disadvantaged students in Nigeria. Additionally, he shares his expertise as a guest lecturer at various UK universities.

Overall, Osi's career spans impactful leadership in energy, technology, and academia, coupled with a strong commitment to philanthropy, shaping industries and positively influencing aspiring professionals and underprivileged communities in Nigeria and the UK.

BRIEF PROFILE OF DR. DAVID EBONGUE



David Ebongue is a revered figure in the field of mechanical engineering, characterized by an impressive educational background and extensive professional expertise. He embarked on his educational journey at Politecnico di Milano, Italy, where he obtained an Engineering Degree in Energy & Mechanical Engineering, laying a robust foundation for his career. Subsequently, he pursued a Master of Science degree in Mechanical Engineering at Università degli Studi di Ferrara, enhancing his knowledge in mechanical systems.

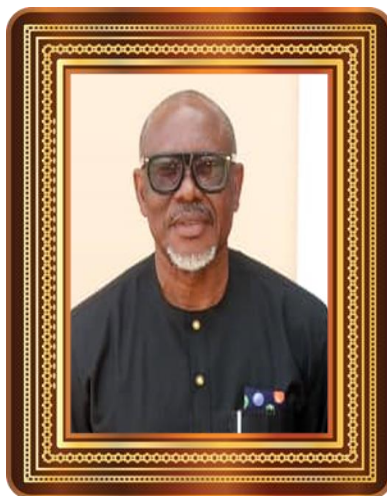
Driven by a fervent interest in aerospace technology, David pursued a Master of Science in Thermal Power (Aerospace Propulsion) at Cranfield University, UK, delving into the complexities of power generation systems and aerospace propulsion. His pursuit of knowledge culminated in a PhD in Mechanical Engineering from Politecnico di Milano, focusing on the design and verification of rolling bearings for gas turbine aero engine main shafts, a significant advancement in gas turbine functionality.

David's professional journey reflects his excellence and expertise across various esteemed organizations. He served as a Project Engineer at Compressor Controls Corporation and IDEX Corporation in Milano, Italy, managing critical engineering projects related to control systems and innovative engineering solutions. His tenure as a Gas Turbine Performance Engineer at Quest Global Ltd., Rolls Royce, Derby, UK, focused on optimizing gas turbine systems, enhancing their efficiency and performance.

Elevating his career further, David assumed pivotal roles, such as Research and Development Supervisor at Watts Water Technologies in Biassono, Monza, Italy, leading groundbreaking research projects in water technologies. Currently, he serves as a Research Lead at Politecnico di Milano, Italy, contributing his expertise to cutting-edge research in mechanical engineering.

David Ebongue's legacy is marked by his commitment to innovation, his invaluable contributions to gas turbine technology, innovative engineering solutions, and advancements in water technologies. His dedication to advancing knowledge in mechanical engineering continues to inspire future engineers and researchers in the field.

BRIEF PROFILE OF PROF. VICTOR I. O. NDIRIKA



Professor Victor Ifeanyichukwu Obiora Ndirika is a distinguished figure in Agricultural and Bioresources Engineering, rising from an Assistant Lecturer to a Professor at Ahmadu Bello University Zaria and later at Michael Okpara University of Agriculture Umudike. His academic journey includes a B.Tech in Agricultural Engineering, M.Sc., and Ph.D. from Ahmadu Bello University, supplemented by specialized training in Food Engineering Research from the University of Pretoria, South Africa.

Throughout his career, Professor Ndirika held significant roles: Department Head and Dean, College of Engineering and Engineering Technology at Michael Okpara University. He contributed extensively to research, focusing on Biomass Energy, Bio-Processing, Storage Engineering, and Post-harvest Systems Modeling, resulting in over 100 publications in prestigious journals and books.

His expertise has been recognized globally, serving as a Post-Doctoral Research Fellow at the University of Pretoria, a Visiting Professor at the University of Borås in Sweden, and an External Examiner for universities worldwide. He's engaged with reputable journals as a reviewer and editorial board member and consulted for national and international institutions.

Professor Ndirika's contributions extend beyond academia; he's actively involved in community service, mentoring young minds in Nigeria and the UK, and supporting education for underprivileged students. His dedication to research has earned him numerous awards, scholarships, and research grants over his 32-year career.

He's a registered Engineer, a Fellow of the Nigerian Institution of Agricultural Engineers, and a member of several engineering societies. His personal life is grounded in family, being happily married to Prof (Mrs) Maryann Chinwe Ndirika and a proud father of four children.

Professor Ndirika's legacy lies in his immense contributions to agricultural engineering research, academic leadership, and his commitment to uplifting others through education and community service.

BRIEF PROFILE OF MR. ISAAC MARTINS



Isaac Martins, a seasoned professional, currently serves as a Product and Sales Manager at Huawei Technologies Co., Ltd., based in China. His extensive expertise stems from a diverse background, including prior engagements in Nigeria's Fintech industry before joining Huawei. Isaac is a driven individual with a Master's degree in Computer Science, specializing in Artificial Intelligence and Data Science, attained with Distinction from Covenant University. His foundational education includes a Bachelor's Degree in Computer Science from Babcock University, Nigeria.

His professional journey exhibits a profound grasp of cloud computing and recommendation systems, substantiated by authored works that underscore his expertise in these domains. At Huawei, Isaac is an integral part of initiatives aimed at spearheading the deployment of 5G products across Africa. Notably, he assumes a leadership role as a Team Lead, overseeing various surveys and trials specifically focused on 5G advancements in Nigeria.

Isaac's adeptness in cutting-edge technologies, particularly in the realms of artificial intelligence, data science, and cloud computing, aligns seamlessly with Huawei's commitment to innovation and technological evolution. His proactive involvement in driving 5G deployment signifies his strategic contributions in bridging technological gaps, especially in emerging markets like Nigeria.

As a Product and Sales Manager at Huawei, Isaac epitomizes a fusion of technical prowess and managerial acumen, navigating the complexities of technology integration while spearheading transformative initiatives. His dedication to advancing technological landscapes, particularly in Africa's telecommunications sector, underscores his commitment to propelling Huawei's global presence while catalyzing digital transformation in burgeoning markets. Isaac Martins continues to be an invaluable asset in Huawei's endeavors, harnessing his multifaceted skill set to drive technological innovations and elevate the company's footprint in pivotal sectors across Africa.

Day 1: Conference opening ceremony & Plenary Sessions

Venue: Shell Building, UNICROSS

Virtual Line/Zoom Link:

<https://uofglasgow.zoom.us/j/83154022170?pwd=ZEV0UkZyYmlwb0kwN3JuaHJseXE4QT09>

- Arrival, onsite registration, & accreditation of participants (9:00am – 11:00am)
- Introduction of dignitaries (11:00am – 11:15am)
- Opening Prayer (11:15am – 11:20am)
- National Anthem (11:20am – 11:25am)
- State Anthem (11:25am – 11:30am)
- Declaration of the Conference open by the Vice Chancellor (11:30am – 11:35am)
- Host's welcome address (Dean, Faculty of Engineering, UNICROSS) (11:35am – 11:40am)
- ICEST Committee Chairman's welcome address (11:40am – 11:45am)
- Group Photograph with invited dignitaries (11:45am – 11:55am)
- Citation of keynote speaker: Engr. Prof. Ezendu Ariwa (11:55am – 12:00pm)
- Keynote Lecture: Topic: (12:00pm – 12:45am)
- Remarks on the keynote lecture (12:45pm – 12:50pm)
- Vote of thanks by the ICEST committee chairman (12:50pm – 12:55pm)

Plenary Papers by Guest speakers

- **Plenary Paper 1:** Unlocking the potentials of Agricultural Engineering for Sustainable Agriculture in Nigeria; by Prof. Victor Ndirika (1:00pm – 1:40pm).
- **Plenary Paper 2:** The future of power generation in sub-Saharan Africa; by Dr. Osita Chukwuma (1:50pm – 2:30pm).

LUNCH BREAK (2:30pm – 3:00pm)

- **Plenary Paper 3:** 5G application and services for sustainable development: the future for Nigeria; by **Mr. Isaac Martins (3:00pm – 3:40pm)**
- **Plenary Paper 4:** Utilization of indigenous food in combating food insecurity amidst sustaining development; by Prof. Akindele

- **Plenary Paper 5:** Achieving a clean sky with zero emission fuel aircrafts and onboard renewable systems: Lessons from Europe; by **Dr. David Ebongue** **(4:40pm – 5:20pm)**
- Remarks on Plenary Papers (5:20pm – 5:30pm)
- Closing
- **Plenary Paper 6:** Current and on the horizon eVTOL technologies for urban transportation; by **Dr. Burhan Saeed (2:00pm – 2:20pm) – Day 2**

National Anthem

Arise, O Compatriots
Nigeria's call obey
To serve our Fatherland
With love and strength and faith.
The labour of our heroes past
Shall never be in vain,
To serve with heart and might
One nation bound in freedom, peace and unity.
O God of creation,
Direct our noble cause;
Guide our Leaders right:
Help our Youth the truth to know,
In love and honesty to grow,
And living just and true,
Great lofty heights attain,
To build a nation where peace and justice reign

State Anthem

Land of our Birth, we pledge to thee,
Our love and toil in the years to be,
When we are grown and take our place,
As men and women we are raise.
Cross River State our faith, our pride
Almighty God all thanks to thee
Our Motherland we pledge to thee
Heads, Hearts and hands in the years to be

WELCOME ADDRESS BY THE HOST

An address presented by the Dean of Engineering, University of Cross River state, (UNICROSS), Nigeria, on the occasion of International Conference on Engineering, Science, and Technology (ICEST) for sustainable development.

The Vice-Chancellor
 Management Team of the UNICROSS
 Keynote speakers/Resource Persons
 Professors from different disciplines
 The local organizing committee
 All participants

In 2021, we met here for the maiden conference of the Faculty of Engineering, though in collaboration with IITEDA, the results recorded in that conference motivated our resolve for a bi-annual conference. The world is groaning and yearning for the manifestation of Engineering, Science, and Technology for sustainable development. Mostly in Africa, technological advancement and innovation through research would definitely result in speedy social, economic, and environmental growth. Human activities on the planet Earth have both positive and negative effects. Through research, negative consequences can be reduced and the positive consequences increased. When you x-ray into the energy sector, food and agricultural sector, transport section, industrial sector, electric power sector, building and infrastructural sector, commercial sector of Nation's economies within African states, you will see that Africa is still crawling compared to the western world in terms research. A lot still need to be done in this regard. Directed Engineering, science and Technology research can provide solution to and redefine our democratic process, set standards in the industrial, commercial and energy sectors.

ICEST, 2023 conference whose major theme is; **Utilizing the Knowledge of Engineering, Science and Technology for Sustainable Development**, brings together keynote speakers, resource persons, and paper presenters from different research areas. It is believed that, this conference that is well package by the Local Organizing Committee (LOC) is rich enough to equip all participants with innovative and sustainable ideas creating new research areas to meet the 21st century developmental goals. Your participation in this conference will be rewarding.

I wish you all the best in this ICEST, 2023

Engr Prof Eko James Akpama
 Dean, Faculty of Engineering, UNICROSS

WELCOME ADDRESS BY THE ICEST COMMITTEE CHAIRMAN

Good morning,

The Vice Chancellor, Cross River University of Technology, Calabar, Prof. Augustine Oko Angba,

The DVC Academic, Prof. Joy Etiowo,

The DVC Administration, Prof. B. Ekefre

The Registrar, Mr. Ephraim Ene,

The Bursar, Dr. Ekpe I.

The Chief Librarian, Dr. Mrs. Iyishu

The Dean, Faculty of Engineering, UNICROSS, Prof. Eko James Akpama,

Very Distinguished Professors and senior Colleagues,

Directors and Heads of different Departments,

Keynote Speaker and Guest Speakers for this valuable Conference,

Very distinguished guests and participants,

Ladies and Gentlemen.

I am highly humbled and delighted to welcome you to the International Conference on Engineering Science and Technology for sustainable development. The theme for this year's conference is – Utilizing the knowledge of Engineering, Science and Technology for Sustainable Development. This conference is organized by the faculty of Engineering, University of Cross River State, UNICROSS, Calabar. This Conference is the second of its kind, as the first one was organized in conjunction with International Information Technology and Economic Development Association (IITEDA), UK, in November, 2021. The 2022 conference could not hold due to ASUU strike.

This year's conference has witnessed the submission of articles and registration of participants from all over the world, including public and private sectors, academia, and professionals in Engineering, Sciences, Technology, Agriculture, health, communication, media, developmental partners, and non-governmental organizations.

ICEST 2023 seeks to identify different challenges and opportunities and set agenda towards meeting Sustainable Development Goals (SDGs). Participants will be presenting evidences of scholarly inquiries, present best practices from case studies, converse about potential partnerships, and offer fresh insights on the theme. It will also report and discuss influence of AI on Research in Engineering, Science and

Technology for sustainable development. ICEST 2023 will explore the impact of ICT services for achieving circular economy and sustainable development.

Our Keynote and Guest Speakers who will be delivering from UK, USA, China, South Africa and other parts of the world would deal on different topics of interest towards meeting the conference theme, sub-themes and sustainable development goals (SDGs). Peer Reviewed and presented articles would be published in the conference book of abstract and proceedings. While articles with very high academic quality would be selected and published in the TetFund approved NJERU Journal by our team of Technical Experts. The conference promises to be highly interesting and impactful such that at the end of the conference, participants' dream will be fulfilled. We will like to use this opportunity to extend our deep appreciation to the Vice Chancellor of the University of Cross River State, Calabar, Professor Augustine Oko Angba, who has been solidly behind us. Thank you, VC, for your mentorship. Our thanks go to the entire Management Team of UNICROS for their support. We wish to thank the Keynote Speaker, Prof. Enzendu Ariwa who has been inspirational in his dealings with us. Our appreciation goes to all the guest speakers including Prof. Afolarin Alonge, Prof. Obiora Ndirika, Dr. Osita Chuckwuma, Dr. Burham Saeed, Dr. David Ebongue and Mr. Isaac Martins. Thank you so much for your academic contributions and positive impacts. Finally, we want to appreciate members of the university community and especially the members of the Local Organising Committee for their contributions towards the success of this conference.

We are greatly indebted to all our imminent invitees and participants who showed interest in this conference, without you, the conference would not be a reality.

Thank you all for your attention.

Engr. Dr. Simon Ogbeche Odey

Chairman, ICEST Organizing Committee

Day 2: Technical Sessions

Track A: Energy transitioning for green economy/ Electrical power for sustainable development

Track Number	Paper Details
A1	Modeling a hybrid (solar PV, wind and diesel generator) system for Nigeria current, future energy sustainability and improved economic developments using present grid network topology Asuquo Eke ^{a,*} , Akpama EJ ^b
A2	Determining load flow analysis for a hybrid power system using newton Raphson's iterative approach Archibong, EE ^{a,*} , Ekum, AE ^b , Ekpenyong, OE ^c , Akisot, EE ^d
A3	Analysis of a three-phase inverter using space vector pulse width modulation technique Victor O. Atubeh ^{a,*} , Sampson A. Bendor ^b , Eko J. Akpama ^c
A4	Modeling and simulation of proposed Nigeria bus networks with high penetration of hybrid renewable energy for Nigeria future energy sustainability and economic development Asuquo Eke ^{a,*} , Okwoche, Andrew ^b , Lattif, Fatoki ^c , John Umuyi ^d , Akpama E. J ^e
A5	Energy Consumption and Carbon Emissions in the Nigeria's Household Sector U. I. Okoro ^{a,*} , F. I. Abam ^b , M. C. Ndukwu ^c , I. O. Ibor ^d
A6	Modelling UNICROSS Calabar campus electricity distribution network for power quality improvement using capacitor bank Asuquo Eke ^{a,*} , Patrick Odu ^b , Ojobe, Obasi-Sam ^c , Okwoche Andrew ^d , John Umuyi ^e , Lattif, Fatoki ^f , Sunday Dickson ^g
A7	Load flow analysis of the University of Cross River State (Calabar campus) for effective planning and energy delivery Ndifreke Okon Udofia ^{a,*} , Asuquo Eke ^{a,**}
A8	Harmonic analysis and evaluation of 52 bus in Nigeria transmission network Moyosoluwalorun Sonola ^{a,*} , Gertrude Fischer ^b , Eke Asuquo ^c
A9	Design, simulation, and analysis of a single-phase voltage source inverter using sinusoidal pulse width modulation Everistus C. Okafor ^{a,*} , Raymond U. Ezenwosu ^b , Eko J. Akpama ^c

A10	Investigation of electromagnetic radiation from CRUTECH electric power substation Emmanuel O. Onoyom-Ita ^{a,*} , Sunday A. Ojomu ^a Archibong E. Efiomg ^a , Ukoette J. Eka ^b
A11	The transformative role of artificial intelligence in smart energy transition for unprecedented energy sustainability in Nigeria Emmanuel E. John ^{a,*} , Precious-Chibuzo O. Effiom ^b , Samuel O. Effiom ^a , Patrick O. Odu ^b , Igri O. Uket ^a , Samuel E. Nwankwo ^c , Obasisam O. Ojobe ^b
A12	Speed control of DC motor using PWM technique method for industrial applications Oku Ekpenyong Nsa ^{a,*} , Emmanuel E. Effiong ^b , Akpan Anthony ^c

A13	Choice of optimal proportional-integral (PI) controller gains for the control of a buck-boost converter fed by PV array Orioha T. Samuel ^{a,*} , Eko J. Akpama ^b , Raymond, U. Ezenwosu ^c
A14	Design and analysis of a buck-boost DC-DC converter fed by a photovoltaic (PV) array Henry C. Nnoruka ^{a,*} , Raymond U. Ezenwosu ^b , Eko J. Akpama ^c , Orioha T. Samuel ^d , Everistus C. Okafor ^e , Elizabeth U. Effiong ^f
A15	Analysis of electro hydraulic actuator servo system using proportional integral derivative (PID) controller for system stability Etito, BM ^{a,*} , Paul, AB ^b , Akpama, EJ ^c
A16	Development of an ultimate gain proportional integral derivative (PID) controller for control of electro hydraulic actuator servo system Etito, BM ^{a,*} , Paul, AB ^b , Ohiero, P ^c
A17	Modeling and evaluation of Calabar transmission line network for load flow and transient stability for future grid expansion Patrick Odu ^{a,*} , Ojobe, Obasi-Sam ^a , Asuquo Eke ^b , Akpama E.J ^b
A18	Modelling and simulation of an adaptive gain PID controller for a direct torque fuzzy speed-controlled induction machine drive Osundina, Emmanuel Mayowa ^{a,*} , Eko James Akpama ^b

Track B: Sustainable infrastructure & environmental development/Sustainable materials & product innovation for green economy

Track Number	Paper Details
B1	Development of cement stabilized interlocking masonry block cubes using aluminum waste and granite powder Hyginus Obinna Ozioko ^{a,*}
B2	Analysis of rainfall and temperature over a sub-basin of Lake Chad, Nigeria Aminu, A. ^{a,*} , Animashaun I. M. ^b , Otache Y. M. ^c
B3	Sustainable Materials for Green Economic Advancement with a Focus on Biosynthesized Nanomaterials Ukueje Etabiese Wisdom ^{a,*} , Fidelis Abam ^b , Anthony Obi ^a
B4	Flood mapping of Calabar river using HEC-RAS and QGIS Ibiang, Ibiang Ibiang, Ibiang Ebri ^{a,*} , Hycienth Edudi ^b
B5	Analysis of geotechnical properties of solid waste and natural soil site for structural foundation F. C. Onyeka ^a , T. E. Okeke ^{b,*}
B6	Mathematical modeling of seasonal rainfall prediction and climate change impact in Cross River State: A Case Study Calabar Metropolis J.G. Egbe ^{a,*} , A.A. Enya
B7	Development of an extension stand to aid performance in table saw machines Asibong Icha ^{a,*} , Simon Odey ^a , Milliscent Ededet ^a , Happiness Bassey ^a
B8	Modified design approach for conventional oil water separator Emmanuel Ewa Ekeng ^{a,*} , Ibiang, Ibiang Ebri ^b

B9	Assessment of wood waste for energy generation in Benin City, Edo State, Nigeria Milliscent Ededet ^{a,*} , Asibong Icha ^a , Michael Akpan ^a , Emmanuel Ugbong ^a
B10	Comparative analysis of the effect of using groundnut shell and rice husk waste ashes for soil stabilization Ibiang, Ibiang Ebri ^{a,*} , Emmanuel Ewa Ekeng ^b
B11	Urea -formaldehyde free particleboards from wood wastes using glutaraldehyde modified cassava starch as binder Atowon, A. D ^{*a} , Ita. E.O ^b , Ushie, E.O ^c , Ugbong, E.A ^d
B12	Physio-mechanical properties of cement bonded particle board (CBPB) manufactured from three (3) wood species in Cross River State, Nigeria Emmanuel Akomaye Ugbong ^{*a} , Peter Nentui Etta ^b , Milliscent Ededet ^c
B13	Microstructural developments in plain and slag-blended cements Joseph O. Ukpata ^{a,*}
B14	Performance evaluation of laterite crushing machine for sustainable housing delivery in Nigeria Achema, F ^{a,*} , Bakam, VA ^a , Apeh, ES ^b , Yahaya, BS ^b , Isheni, Y ^a
B15	Development of a Low-Cost Slider-Crank Apparatus for Teaching Purposes Bello RS ^{a*} , Odey SO ^b , Igwe DC ^b , Onu BO ^a , Nebo EU ^a , Elendu OE ^a
B16	Characterisation and utilization of coir fibre as reinforcement for geopolymer composite Ukeme Enoch Akpan ^{a,*} , Maria Kaka Etete Enoch ^b
B17	Biodiesel a sustainable fuel: exploring the feedstocks and production process Ifiok J. Ekaette ^{a,*} , Fidelis I. Abam ^b , Hyginus U. Ugwu ^a
B18	Assessment of quality of tanker vended water in Enugu metropolis Okorie, J.C ^a , Odenigbo, C.E ^{b,*}
B19	Positive environmental impact of biodiesel as an alternative fuel B. D. Nkanang ^{a,*} , F. I. Abam ^b , M. C. Ndukwu ^a
B20	Sequence analysis of heat resistant gene in naked neck Nigerian indigenous chicken Etta, Hannah Edim ^{a,*} , Ikika, Patricia ^b
B21	Relevance of electromagnetic energy to medical imaging and its effect on health Jehoshaphat John Egbai ^{a,*}

B22	Analysis of hydraulic performance and flow characteristics in sloping channels with rising floor ends Iniko Ekeng Bassey ^{a,*} , Ekom, Robert Ibingha ^b , Ofem Ofem Inah ^c
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Track C: Communication & control systems/AI for sustainable economy

Track Number	Paper Details
C1	Comparative studies on MTN, Airtel, Globacom, and 9mobile internet speeds in CRUTECH, Calabar campus with the aid of Python Ojomu, SA ^{a,*} , Ekum, AE ^b , Anyin, PB ^c
C2	Performance Evaluation of the Travelling Wave Tube Design for Security and Surveillance Operations Udo, E. U. ^{a,*} and Ezebuiro, I. I. ^b
C3	Development of an SMS-based accurate notification system for improved pipeline leakages Gertrude A. Fischer ^{a,*} , F. I. Anyasi ^b , Sunday A. Ojomu ^b
C4	1. Monitoring of leakages in crude oil/gas pipelines using a wireless system network internet of things (IoT) Gertrude A. Fischer ^{a,*} , F. I. Anyasi ^b , Sunday A. Ojomu ^c
C5	Design and implementation of a university smart attendance tracking system using geo-location and IOT Gertrude A. Fischer ^{a,*} , Victor Ojong ^b , Eyo Inameti ^c
C6	2. Development of a self-governing system for optimal navigation of unmanned ground vehicles in dynamic path Omosefe Jacob ^{*a} , Peter O. Ohiero ^b , Paul B. Anyin ^c
C7	3. Refraction algorithm method for the development of handover transfer channels for GSM networks in Nigeria Peter Oritsetimeyin Tim ^{a,*} , Sunday Abayomi Ojomu ^b , Olumide Cornelius Osungbohun ^c
C8	4. Evaluation of pathloss exponential of NTA Port Hacourt signal strength within Calabar metropolis Emmanuel S. Imoh ^{a,*} , Sunday A. Ojomu ^b , Sampson Bendor ^c , Paul Anyin ^d , Eyam Ekum ^e
C9	5. Design and construction of microcontroller-based programmable DOT matrix information display system Balogun TJ ^{a,*} , Ojomu SA ^b , Philip PA ^c , Effiwatt FO ^d , Ojobe EO ^e , Asuquo GE ^f

- C10 **6. Design and simulation of the 8th order active low pass**
 Gospel Chukwudalu Daniel ^{a,*}, Paul Bentiang Anyin ^b, Raymond U. Ezenwosu ^c
- C11 **7. Actor-critic modulation index controller for improved power factor of slip energy recovery drive**
 Anyin Paul ^{a,*}, Akpama James ^b, Ohiero Peter ^c
- C12 **Design and construction of a UAV air to ground autonomous channel system**
 Paul Okim ^{*,a}, Gertrude Fischer ^b, Paul Betiang ^c, Bendor Sampsom ^d, Archibong Efiang ^c
- C13 **Nollywood movie sequences summarization dataset for machine learning applications**
 Ofut, Ogar Tumenayu ^{a,*}
- C14 **Design and development of e-learning for the Department of Electrical and Electronic Engineering, University of Cross River State (UNICROSS)**
 Etim, Otu Mesembe ^{a,*}, Gertrude Fischer ^b, Asuquo Eke ^c, Paul Anyin ^d
- C15 **Design and simulation of a hand motion remote control system using sensor-based technology**
 Ekechi, Faith Onyinyechi ^{a,*}, Gertrude Fischer ^b
- C16 **8. Design and implementation of a library management system using python**
 Ayano Samuel Jesumayomikun ^{a,*}, S. A. Ojomu ^b, Gertrude Fisher ^c, Emmanuel Onoyom-Ita ^d
- C17 **9. Design and analysis of a rectangular microstrip patch antenna for s-band wireless communication systems**
10. K. A. Ojikutu ^{a,*}, F. I. Anyasi ^b, S. A. Ojomu ^a

Paper Presentation Schedule

Physical Presentation 1

Join Zoom Meeting

<https://uofglasgow.zoom.us/j/81270905624?pwd=VW5jNXVDQ0tXSCtNd21SYnJzZHBOZz09>

Meeting ID: 812 7090 5624

Passcode: 882665

Venue: Shell Building, UNICROSS	
Time: 9:30am – 5:00pm	
Chairman: Engr. Prof. Fidelis Abam	
Rapporteur: Engr. Dr. Vincent Ogar/Engr. Bendor Sampson	
Time	Track Number
9:40 – 10:00	A1
10:00 – 10:20	A2
10:20 – 10:40	A3
10:40 – 11:00	A4
11:00 – 11:20	A6
11:20 – 11:40	A7
11:40 – 12:00	A8
12:00 – 12:20	A9
12:20 – 12:40	A10
12:40 – 1:00	A12
1:00 – 1:20	A13
1:20 – 1:40	A14
1:40 – 2:00	LUNCH
2:00 – 2:20	A15
2:20 – 2:40	A16
2:40 – 3:00	A17
3:00 – 3:20	B1
3:20 – 3:40	B2
3:40 – 4:00	B3
4:00 – 4:20	B4

4:20 – 4:40	B5
4:40 – 5:00	B6
Collection of Certificates	

Physical Presentation 2

Join Zoom Meeting

<https://uofglasgow.zoom.us/j/81270905624?pwd=VW5jNXVDQ0tXSCTNd21SYnJzZHBOZz09>

Meeting ID: 812 7090 5624

Passcode: 882665

Venue: Engineering Conference Room, UNICROSS	
Time: 9:30am – 5:00pm	
Chairman: Engr. Dr. Jerome Egbe	
Rapporteur: Engr. Dr. Vincent Ogar/Engr. Paul Anyin	
Time	Track Number
9:40 – 10:00	B7
10:00 – 10:20	B8
10:20 – 10:40	B9
10:40 – 11:00	B10
11:00 – 11:20	B11
11:20 – 11:40	B16
11:40 – 12:00	C1
12:00 – 12:20	C3
12:20 – 12:40	C4

12:40 – 1:00	C5
1:00 – 1:20	C6
1:20 – 1:40	C7
1:40 – 2:00	LUNCH
2:00 – 2:20	C8
2:20 – 2:40	C9
2:40 – 3:00	C10
3:00 – 3:20	C11
3:20 – 3:40	C12
3:40 – 4:00	C13
4:00 – 4:20	C14
4:20 – 4:40	C15
4:40 – 5:00	C16
Collection of Certificates	

Virtual Presentation

Join Zoom Meeting

<https://us06web.zoom.us/j/89733822119?pwd=FmgJuSJtSEPzIH0PIYszYtJlk5Tkp9.1>

Meeting ID: 897 3382 2119 **Passcode:** 954259

Time: 9:30am – 4:00pm	
Chairman: Engr. Dr. Joseph Ukpata	
Rapporteur: Dr. Ogar Ofut	
Time	Track Number

9:40 – 10:00	A5
10:00 – 10:20	A11
10:20 – 10:40	B1
10:40 – 11:00	B2
11:00 – 11:20	B3
11:20 – 11:40	B5
11:40 – 12:00	B12
12:00 – 12:20	B13
12:20 – 12:40	B14
12:40 – 1:00	B15
1:00 – 1:20	B16
1:20 – 1:40	B17
1:40 – 2:00	LUNCH
2:00 – 2:20	Plenary Paper 6
2:20 – 2:40	B18
2:40 – 3:00	B19
3:00 – 3:20	C2
Collection of Certificates	

BOOK OF ABSTRACTS

1. Mathematical modeling of seasonal rainfall prediction and climate change impact in Cross River State: A Case Study Calabar Metropolis

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Abstract: In this study, mathematical modeling of Seasonal rainfall and climate change impact in Calabar, annual rainfall was analyzed for trend and climate variability events from three input parameters, Rainfall, maximum temperature, and relative humidity with a focus on seasonal variability for Calabar. Monthly rainfall data from in-situ measurements over a period of 31 years (1991 - 2020) was used for the study and were obtained from archives of the Nigerian Meteorological Agency (NIMET) Calabar Center. Rainfall variability was examined as standardized rainfall departures used to identify and delineate the extent to which the input parameters impact the climate of Calabar. For the rainfall services, we use a seasonal Autoregressive Integrated Moving Average (SAEIMA) model with mini tab programming software. From the least square regression equations, and plots, the average annual rainfall for Calabar is 348mm/year recorded in 2012, trend (MAPE) mean absolute percentage error 26690.0, (MADE) mean absolute deviation error 156.0, (MASD) mean absolute standard deviation 35479.7, The temporal statistical equations indicates that there is an increase in rainfall, temperature (MAPE) 4.82570, (MADE) 1.48176, (MASD) 3.22941 and relative humidity of 0.0832 mm/yr, 0.0020c and 0, respectively, (MAPE) 4.5431, (MADE) 3.7450, (MASD) 25.2547. This result underscores the need for effective monitoring of Calabar rainfall for prompt warnings and responses that would guarantee effective risk reduction and management in the run –into the occurrences of extreme events, that might hinder engineering practices since building and construction works are not favorable to rainy season.

Keywords: Climate change, rainfall prediction, mathematical modelling, Calabar

2. Modified design approach for conventional oil water separator

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Abstract: Designing the conventional oil-water separator with the City of Tacoma design approach and the Modified design method approach all satisfied the API design criterion. The City of Tacoma design approach is a standard method and procedure for designing conventional oil-water separators with respect to API criteria. In most design approaches relating to oil-water separators, pressure was invariably not an inclusive criterion, hence the need to incorporate pressure into the design approach named modified design method became an important part of this work. The API design criteria were the same as applicable to both the City of Tacoma design approach and the modified design method. It is interesting to note that the various parameters calculated seem to be in agreement with each other when considering the two design methods. However, there was significant improvement in the design length of the separator using the modified design method as compared to the city of Tacoma design manual. Knowing the initial pressure of the vessel prior to hydro-testing through the design approach can enhance the proper working of the vessel.

Keywords: Flow rate, separation efficiency, volume, pressure, aspect ratio

3. Comparative analysis of the effect of using groundnut shell and rice husk waste ashes for soil stabilization

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Abstract: Traditional methods of soil stabilization have limitations, prompting the search for sustainable alternatives, particularly in waste materials. The study compares the performance of two potential soil stabilizers: groundnut shell ash (GSA) and rice husk ash (RHA). Laterite soil of different mix ratio when combined with GSA and RHA were subjected to standard compaction tests, California bearing ratio tests and unconfined compressive strength tests. Generally, the California Bearing Ratio (CBR) of untreated laterite soil increases following the incorporation of RHA and GSA. A mixture composed of 90% soil and 10% GSA demonstrates the least incremental increase at 62.07%, ultimately resulting in a CBR of 5.17%, while a combination of 75% soil, 15% RHA, and 10% GSA exhibits the most substantial rise, boasting an impressive 196.24% increase and achieving a CBR of 9.45%. The study

also examines Unconfined Compressive Strength (UCS) and cohesion of untreated laterite soil. Moreover, the study explores the Unconfined Compressive Strength (UCS) and cohesion of untreated laterite soil, initially quantifying them at 48.95 Kpa and 24.475 Kpa, respectively. Following the incorporation of RHA and GSA stabilizers, both UCS and cohesion undergo substantial improvements. The research emphasizes the importance of conducting site-specific assessments, considering environmental impact, and formulating standardized guidelines for responsible waste material utilization in soil stabilization.

Keywords: Groundnut shell, rice husk, waste ashes, soil stabilization

4. Flood mapping of Calabar river using HEC-RAS and QGIS

5. Ibiang, Ibiang Ibiang, Ibiang Ebri ^{a,*}, Hycienth Edudi ^b

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Abstract: The research's primary objective is to conduct an in-depth Flood Mapping of the Calabar River utilizing HEC-RAS and QGIS, addressing a multi-faceted set of challenges and prospects intrinsic to this specific geographical context. To attain this overarching objective, a suite of interconnected objectives was meticulously outlined. These encompassed the extraction of precise coordinates via Google Earth Pro, the development of an accurate Digital Elevation Model (DEM) within QGIS, the creation of a georeferenced Location Projection file, and the construction of high-precision floodplain maps using HEC-RAS. Furthermore, the research aimed to evaluate flood risk, recognizing the dynamic interplay between topography, hydrology, and the inherent geomorphological complexities of the Calabar River. The methodology employed for this research entailed intensive geospatial analysis, which was conducted with precision and rigour. QGIS served as the principal tool for creating the DEM, shedding light on the intricate topography of the study area, from Ikot Okon to Ikot Ekpene. Employing a Manning coefficient of 0.03 for the natural riverbed and 0.06 for the left and right riverbed sides, HEC-RAS facilitated steady flow simulations, delineating various hydraulic parameters, including discharge, velocity, and water rating curves. Three profiles were employed in the simulation of flood mapping in the study area. The resulting velocity profiles, water elevation plots, and inundation area calculations were instrumental in deciphering the dynamics of Calabar River's flow patterns. The findings disclosed crucial insights, pinpointing the highest water elevations at the upstream and downstream ends of the study area, underscoring the presence of distinct profiles with varying inundation potential. Profile 2 and Profile 3 exhibited a notably higher risk of inundation, implicating an expanded flood-affected region if water levels correspondingly rose to the elevation of these profiles. These revelations underscore the imperative of comprehensive flood mapping and robust risk assessment in flood-prone regions, serving as a foundation for informed decision-making in flood management and disaster preparedness. In this context, Profile 2 reports 4169622.86719999 square feet as the area expected to be flooded, while Profile 3 reports 6467880.9435 square feet. These values elucidate the extent of land that could be inundated if water levels reached the corresponding profile elevations.

Keywords: Flood mapping, Calabar, river, HEC-RAS, QGIS

6. Modeling a hybrid (solar PV, wind and diesel generator) system for Nigeria current, future energy sustainability and improved economic developments using present grid network topology

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Abstract: Sustainable development can be achieved through; energy sustainability, industrial revolution, political stability, improved agricultural sector and mechanized farming, improved and adequate transportation network, adequate communication infrastructure, etc. Developing a sustainable Energy model that drives economic development is timely. Institutional energy availability as in the Cross River University of Technology, Calabar where numerous economic activities possess a challenge. It is observed that, many of these private business owners run their small petrol generators which adds to air pollution. The University community is challenged by the presence of these dangerous gasses. This makes it necessary to improve the energy mix using hybrid system. Thus, this paper models a hybrid (Solar PV, Diesel Generator and the National grid) automated power system to provide constant energy to the thickly populated University community with diverse economic activities, thereby guarantying energy stability, reliability, and its security. The work is aimed at providing sustainable power that is environmentally friendly, less expensive and low maintenance cost. The model is developed using HOMER/ETAP software's which gives better and reliable solution to power system sizing. The present and future worth, initial cost, maintenance cost, solar irradiant and load demand estimate were among the parameters of interest considered. When comparing the results with different energy sources in the network during simulation, it is observed that, it reveals that, the renewable in the network has 80.8% penetrations level, and

power quality availability rose 81%, the system witness 35% reductions in maintenance cost. These results justify the proposal of hybrid system compared to stand alone system.

Keywords: Hybrid System, Future energy sustainability, economic development, energy improvement and planning

7. Determining load flow analysis for a hybrid power system using newton Raphson's iterative approach

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Abstract: The integration of renewable energy sources in modern power system has led to the development of hybrid power systems, presenting unique challenges in maintaining stability and ensuring efficient power flow. This paper explores the application of Newton Raphson's iterative method for load flow analysis for a hybrid power system. The study focuses on optimizing power flow calculations, considering the intricate interconnections or multiple energy sources, such as solar, wind, and conventional sources, along with energy storage systems. The Newton Raphson approach is employed to iteratively solve the complex power flow equations, considering various constraints and components' characteristics. The paper delve into the mathematical formulation of the method, emphasizing its suitability for handling non-linear power flow equations in a hybrid power system context. Additionally, the study examines the impact of varying parameters, such as load demand, renewable energy availability, and system contingencies on the convergence and accuracy of Newton Raphson algorithm. The results demonstrate the efficiency of the proposed method in achieving load flow solutions for hybrid power systems, offering insights into system performance, stability, and potential enhancements in operational planning and management. The findings underscore the significance of utilizing iterative methods like Newton Raphson for load flow analysis in complex hybrid power systems, fostering more reliable and efficient integration of diverse energy sources.

Keywords: Newton Raphson, solar PV, generator, wind power and power systems

8. Analysis of a three-phase inverter using space vector pulse width modulation technique

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Abstract: This paper investigates the Space Vector Pulse Width Modulation (SVPWM) technique for three-phase inverters using MATLAB Simulink. Three-phase inverters are crucial in various applications, and optimal modulation techniques are essential for efficiency. The study focuses on SVPWM, known for maximizing DC bus voltage utilization while minimizing harmonic distortion. Through Simulink models, the research explores SVPWM's impact on output waveforms, efficiency, and total harmonic distortion, providing insights into its potential for applications requiring reduced harmonic content. A comparative analysis with Sinusoidal Pulse Width Modulation (SPWM) is conducted, evaluating parameters such as total harmonic distortion, output voltage quality, and efficiency. The findings highlight the strengths and weaknesses of each technique, emphasizing the importance of selecting the right modulation technique for diverse applications. The study's results contribute valuable information for improving the efficiency and reliability of power electronic systems in various industries.

Keywords: SVPWM, SPWM, Total harmonic distortion

9. Development of an ultimate gain proportional integral derivative (PID) controller for control of electro hydraulic actuator servo system

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Abstract: The application of electro-hydraulic actuator servo systems in various industrial and aerospace settings demands a level of precision and adaptability that is often challenging to achieve with conventional control methods. The Proportional Integral Derivative (PID) controller has long been the cornerstone of control solutions, offering the promise of accurate regulation in the face of complex system dynamics. However, traditional PID controllers are constrained by their static parameters, rendering them less effective in addressing the intricacies and nonlinearities inherent in electro-hydraulic actuators. In response to this challenge, this article introduces a ground breaking approach; the Ultimate Gain Adaptive PID controller. This novel control strategy fuses the fundamental principles of PID control with adaptive algorithms, enabling the PID parameters to dynamically adjust in real-time

in response to the system's behavior and external influences. The article first describes the mathematical model of the system, followed by the design methodology of the adaptive PID controller. The proposed adaptive PID controller is based on the Ultimate Gain method, and it adapts the controller gains based on the output of the system using feedback. The article also presents simulation results indicating the performance of the proposed control scheme compared to a conventional PID controller tuned with Genetic algorithm and Ziegler-Nichol's method. The results suggest that the proposed adaptive PID controller provides better tracking performance, reduced overshoot, and improved stability for the electro-hydraulic actuator servo system. The article concludes that the proposed adaptive PID controller can be a potential solution for precise control of such complex systems.

Keywords: PID controller, servo system, electro-hydraulic actuator

10. Analysis of electro hydraulic actuator servo system using proportional integral derivative (PID) controller for system stability

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Abstract: Analysis of Electro Hydraulic Actuator Servo System (EHASS) using Proportional Integral Derivative (PID) Controller for system stability presented to (ICET). The purpose of this work is to remodel Genetic Algorithm (GA) optimized PID controlled parameters, nonlinearity, and uncertainty in EHASS. Ramp input (RI) (RLC) controlled parameters and gain provides stability and control to EHASS spool valve tensile stress setpoint that determine the velocity of the lifter correspondingly. EHASS spool valve convert hydraulic pressure to pneumatic force to pullout the folded iron after receiving signal from Ramp Input RLC controller which components are applied voltage, capacitor, resistor, and inductor to replaced GA optimized PID controlled parameters such as Proportional (kp), Integral (Ki), and Derivative (Kd). The (RI) RLC inputs are Resistive current (IR), Capacitive current (IC), and Inductive Current (IL) which combined to produce current sending total (IST). The IST is Control inputs, Tensile Stress of EHASS spool valve is a setpoint, the velocity of lifter span is the output, and inverse impedance is the feedback. Young Modulus is applied to tensile stress setpoint to determine the ratio of pressure force to area of the valve blades, and the changed between the original length and the extended length of lifter iron determine the lifter velocity output. The aim is to use the setpoint to determine the velocity and feedback gain. Root Stability Criterion proved with contour along the negative left half side of the s-plane with two loci points.

Keywords: Resistive current, capacitive current, inductive current, tensile stress, and strain

11. Design and analysis of a buck-boost DC-DC converter fed by a photovoltaic (PV) array

Henry C. Nnoruka ^{a,*}, Raymond U. Ezenwosu ^b, Eko J. Akpama ^c, Orioha T. Samuel ^d, Everistus C. Okafor ^e, Elizabeth U. Effiong ^f

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Abstract: The focus of this project is on the design and analysis of a buck-boost direct current to direct current (DC-DC) converter powered by a photovoltaic array, aiming to optimize power conversion in response to the rising significance of renewable energy. With the conventional AC power supply's environmental drawbacks, the shift towards DC power conversion becomes crucial for efficiency. The chosen buck-boost converter stands out for its ability to both step-up and step-down voltage, streamlining the process. The project involves meticulous steps: defining converter specs, component selection, circuit design, MATLAB simulation, and OrCAD Cadence validation. Results show superior performance and efficiency compared to other converters, especially in maintaining output voltage. The converter operates efficiently in both buck mode (utilizing a duty cycle of 0.4) and boost modes mode (utilizing a duty cycle of 0.7), exhibiting a steady output with minimal ripple due to a continuous conduction mode. This research significantly contributes to enhancing power conversion effectiveness, particularly when integrated with photovoltaic arrays, promoting cleaner and more efficient energy solutions.

Keywords: Buck-boost, DC-DC converter, photovoltaic, PV array

12. Choice of optimal proportional-integral (PI) controller gains for the control of a buck-boost converter fed by PV array

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Abstract: This research project extensively investigates the process of selecting the most suitable gains for a Proportional-Integral (PI) controller to effectively manage a Buck-Boost Converter powered by a Photovoltaic (PV) Array. The rationale behind choosing a Buck-Boost Converter for this application is its capability to regulate the PV array's output voltage dynamically. The research methodology employs the state-space averaging method to derive the transfer function of the Buck-Boost converter. The mathematical model of the dynamic system is validated using MATLAB/Simulation software for analysis, enabling the derivation of the appropriate transfer function. To determine the optimal gains for the PI controller, the Particle Swarm Optimization (PSO) algorithm is employed, which has demonstrated its effectiveness and reliability in recent times. A MATLAB script is developed for PSO, which is utilized to obtain the suitable values of k_p and k_i . By combining the state-space averaging method, Pulse Width Modulation (PWM) switching, and PI tuning based on PSO, this study aims to establish an efficient and dependable control strategy for the Buck-Boost Converter. The simulation results indicate significant improvements in the system's behavior. When the PI controller is applied, the system response, including the rise time at 0.000124, settling time at 0.00112, overshoot at 9%, and a final value of 0.987. However, when the PI controller is tuned with PSO, with k_p set to 0.30 and k_i to 0.29, the system demonstrates even better performance with a rise time of 5.45e-06, settling time of 9.4e-06, overshoot of 0.315%, and a final value of 1. The results clearly demonstrate the superior performance of the PSO algorithm compared to using a single PI controller.

Keywords: Proportional-Integral (PI), Buck-Boost converter, PV array, particle swarm optimization (PSO)

13. Comparative studies on MTN, Airtel, Globacom, and 9mobile internet speeds in CRUTECH, Calabar campus with the aid of Python

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Abstract: This study tries to establish the internet speed strength of the available networks within the Calabar campus of the Cross River University of Technology. These networks include MTN NIG, AIRTEL NIG, GLOBACOM NIG AND THE 9MOBILE NIG. These are the four major network providers in Nigeria for which CRUTECH Calabar is inclusive. Their upload and download speeds were obtained as well as their ping latency through the use of a programming language tool. The programming language used is the Python programming tools. The different network parameters were selected and computed into the Python tools. Since Python has a real time determining capacity it was able to track down the variations in the upload and download speeds of the available four networks within the study area. The signal strength and speed were determined in four locations within the campus. These locations are: The Vice Chancellor's block, the faculty of engineering block, the female hostel blocks and the new science block commonly called the new CRUTECH. The Python simulated results showed that the average internet speed for MTN NIG download speed within CRUTECH is 57729362.8 Mb/s, upload speed is 9089536.8 Mb/s. AIRTEL NIG average download speed is 9130095.8 Mb/s, upload speed is 5636656.98 Mb/s. GLOBACOM NIG download speed is 1293487.6 Mb/s, upload speed is 874861.58 Mb/s and 9MOBILE NIG download speed is 12792741.4 Mb/s, upload speed is 5797089.4 Mb/s. Thus, the recommended network with the highest upload and download speed within the Calabar campus of CRUTECH is the AIRTEL NIG.

Keywords: MTN NIG, AIRTEL NIG, GLOBACOM NIG, 9MOBILE NIG, Python

14. Design, simulation, and analysis of a single-phase voltage source inverter using sinusoidal pulse width modulation

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Abstract: The growing need for sustainable energy due to fossil fuel depletion, population growth, and economic expansion has intensified efforts to integrate renewable sources. Inverters enable this transition but some, like square wave inverters, damage electronic devices due to their harmonic contents. This project uses SPWM technique to achieve better harmonic performance and to ensure the friendliness of the environment. This project aims to design and analyze a single-phase voltage source inverter utilizing the SPWM technique, with objectives including a literature review on modulation techniques, sizing of filter and storage

components, determining the output filter transfer function, and conducting simulations on MATLAB/Simulink validated by OrCAD Cadence. This project employs a simulation approach to determine component (IGBT, resistor, and DC voltage source) parameters. A transfer function analysis approach was used to calculate the optimal choice of inductor and capacitor sizes for the LC filter. MATLAB/Simulink is used to simulate the single-phase voltage source inverter, validated by OrCAD Cadence for the determination of its performance under real-world conditions. The results show great performance that is much better than a conventional square wave inverter with a total harmonic content of 1.20%, emphasizing the system's ability to minimize harmonic distortion and deliver a quality power supply, which is crucial for applications requiring high-quality power, such as motor drives and sensitive electronics.

Keywords: Single phase, voltage, inverter, sinusoidal pulse, width modulation

15. Harmonic analysis and evaluation of 52 bus in Nigeria transmission network

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Abstract: The 330kV grid in Nigeria, consisting of 52 buses, is confronted with significant challenges, including voltage instability, extended transmission lines, inherent transmission line characteristics, and substantial power losses, which adversely impact both power generation and distribution systems. This study focuses on the harmonic analysis of the Nigerian 52-bus grid, comprising 52 buses, 18 generating stations, and 65 transmission lines. Utilizing ETAP 16.0 as the analytical tool, the research investigates harmonic orders on the 330kV line network in Nigeria. Simulations were conducted using the ETAP 16.0 software package, with input parameters encompassing relative amplitudes and phase angles for both current and voltage source models. Data for the study were sourced from the Power Holding Company of Nigeria (PHCN). The obtained results reveal that some bus voltages exceed the prescribed standard limits. Consequently, it can be deduced from the findings that the existing Nigerian 52-bus grid grapples with considerable line losses, necessitating compensation through the implementation of reactive power support mechanisms, such as Flexible Alternating Current Transmission Systems (FACTS) devices, to optimize line utilization effectively.

Keywords: Load flow, harmonic order, transmission line, voltage instability, power quality

16. Sustainable Materials for Green Economic Advancement with a Focus on Biosynthesized Nanomaterials

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Abstract: The increasing global emphasis on sustainable development and the urgent need to address environmental challenges have led to a growing interest in the search for a solution. The latter has led to a green economy centred on achieving ecological balance and resource efficiency, with green nanomaterials emerging as a transformative solution. These materials are eco-friendly, biodegradable, and possess unique nanoscale properties. They are characterized by environmentally benign synthesis techniques, bioinspired approaches, and diverse industry applications. This work explores the pivotal role of biosynthesized nanomaterials in promoting a green economy. It begins by elucidating the fundamental properties of nanomaterials that confer them with exceptional mechanical, optical, electronic, and catalytic attributes. This paper subsequently explores the diverse applications of nanomaterials across industries while discussing the economic implications. The work underscores the potential of green nanomaterials for achieving a green economy through sustainable energy by enhancing product performance, durability, and energy efficiency. The study addresses safety and ethical considerations and describes the importance of responsible nanomaterial design, risk assessment, and regulatory frameworks. The study concluded that nanomaterials hold immense promise as a cornerstone for driving the green economy.

Keywords: Sustainable development, Green Economy, Nanotechnology, Biosynthesized Industries.

17. Development of an extension stand to aid performance in table saw machines

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Abstract: The extension stand serves as an assistant in the use of the table saw machine (TSM) without an inbuilt extension. This research developed an extension stand to assist the single user during woodworking operations. SOLIDWORKS software 2021 was used in designing the stand. The extension stand consists of medium wooden members (50 x 50 x 75 mm), having four (4) caster wheels at the upper part of the stand. The designed extension stand was fabricated and evaluated. The produced extension stand performed optimally with the estimated cost of manufacturing at N17, 000.00 (US\$38.04) as of 2021. The extension stand as evaluated passed the reliability test; it was strong enough to support the weight of the applied load during the operational process. The stand provides safety; it is affordable and easy to use.

Keywords: Extension stand, Woodworking operation, Table saw machine.

18. Performance Evaluation of the Travelling Wave Tube Design for Security and Surveillance Operations

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Abstract: This paper focuses on the performance evaluation of the travelling wave tube design for security and surveillance operations. The problems associated with travelling wave tube includes low operating efficiency and non-linear behavior associated with the system. Most significant parameters that affects the performance of the travelling wave tube are amplitude to phase modulation conversion, harmonic intermodulation, distortion and noise output injection which influenced the carrier-to-noise ratio of the radio frequency signal. The method employed involves the engineering design of various types of traveling wave tube (TWT), such as missile TWT design which requires minimal size and weight, high efficiency, moderate bandwidth and reliability that utilize unique cathode heater design. The instrumentation TWT design for laboratory and test equipment which incorporates a control grid that can be used to turn on and off TWT beam current. The electronic counter measure (ECM) design involves high continuous wave, high peak power and bandwidth. The RADAR TWT design requires high peak power and the communication TWT design needs high reliability, efficiency, linearity and moderate power output. In conclusion, these travelling wave tubes design can be used to track, monitor, block, attack terrorists, armed robbery, kidnapping and insurgences at various locations.

Keywords: Security operation, Travelling wave tube, Harmonic injection, Engineering design, Terrorism.

19. Development of an SMS-based accurate notification system for improved pipeline leakages

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Abstract: In this study, an SMS-based accurate notification system for improved pipeline leakages is developed. Monitoring the flow rate of petrol and gas through pipe lines has been made easy through the use of hall effect water flow sensor normally connected within the pipe channel. The hall affect flow sensor is designed to generate pulses as the fluid passes through it and transmits these pulses to the ATMEGA328p micro-controller embedded within the admits UNO module used in this research. An additional 16x2 Alphanumeric Liquid crystal display (LCD) is incorporated in the design to persistently display quantities and variables like the volume and flow rate of the fluid in liter/minute (L/M). these results are consistently collated and the moment a decline or drop in the flow rate is perceived by the microcontroller, an error notification is forwarded via SMS to the user through the registered phone number providing information on the drop-in flow rate experienced. This research funds strong relevance in numerous applications ranging from gas factories water board stations amongst other areas where the flow rate of fluid is needed and a means of dissemination of a fact condition is required.

Keywords: Pipeline Leakage, Notification System, Leakage Detection, SMS

20. Load flow analysis of the University of Cross River State (Calabar campus) for effective planning and energy delivery

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Abstract: The electrical power distribution network at the University of Cross River State (UNICROSS) in Calabar, Nigeria, plays a critical role in supporting the diverse academic and administrative activities of the institution. However, with a growing campus and varied energy demands, maintaining voltage stability and ensuring an efficient power supply becomes paramount. This work presents a comprehensive load flow analysis of the UNICROSS Calabar Campus distribution network to address these challenges and optimize its performance. The load flow analysis, also known as power flow analysis, is conducted using the Newton-Raphson method. This iterative technique is employed to approximate the nonlinear power system equations as a set of linear equations, allowing for a detailed examination of voltage profiles, active and reactive power flows, and power losses. The results of the analysis reveal several key findings. Many buses within the campus are operating at voltages well below their nominal values, with a significant portion functioning at only 60% of the nominal voltage. These buses include academic and administrative areas, indicating a potential risk to critical operations. Additionally, certain buses exhibit a marked increase in reactive power, likely due to the presence of inductive loads. In conclusion, this study provides essential insights into the performance and challenges of the UNICROSS Calabar Campus electrical distribution network. Addressing these issues is crucial for maintaining the university's academic excellence and research innovation.

Keywords: Load flow analysis, Newton-Raphson method, electrical power distribution network, voltage stability, University of Cross River State

21. Analysis of geotechnical properties of solid waste and natural soil site for structural foundation

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Abstract: Optimization of landfills as a result of increasing population and demand for infrastructural development has necessitated intensified investigation among engineers. Examining the engineering properties of soils from these landfills is of great concern. This paper presented the bearing capacity of soils from dump sites of municipal solid wastes and natural soil using their shear strength parameters obtained from direct shear tests, after preliminary tests had been carried out to determine index properties of the soil samples. Samples were obtained at 1m, 1.5m, 2m, 2.5m and 3m depth from Jettu site in Edo State, Nigeria. The maximum and least cohesion values were observed to be 24 kN/m² and 17 kN/m², 15 kN/m² and 5 kN/m²; and the maximum angles of internal-friction were 22 °C and 24 °C, while the least internal friction angles were 6 °C and 9 °C for NS and SWSS samples respectively, which denotes that the samples are fine soils with good shear strength and can serve as reliable structural foundation materials.

Keywords: Solid-waste-site soil (SWSS), natural soil (NS), shear strength, bearing capacity

22. Monitoring of leakages in crude oil/gas pipelines using a wireless system network internet of things (IoT)

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Abstract: In this study, the use of an internet of things (IoT) analytics platform service to mimic real-time pipeline monitoring and determine the location of damage on a pipeline. The whole network comprises mainly of HK1100C oil pressure sensor, Arduino Uno board containing ESP32 Micro- controller Wi-Fi, SIM900L GSM module, JHD162ALCD module, audio alarm buzzer, 9V supply. The ATmega328P microcontroller was programmed in C++ programming language. When deployed in Nigeria pipelines, the wireless sensor network is able to monitor oil pipelines against leaks and therefore reduce environmental degradation and economic losses resulting from oil leakages. An Arduino and a Wi-Fi module were combined, programmed and used to produce the wireless communication device which interface with the analytics platform. Signal data was collected once every 15 s and all the channels were updated every 2 min. Thing Speak provided instant visualizations of data posted by the wireless communication

device. Online analysis and processing of the data was performed as it came in. Results showed that a drop in pressure is associated with leak and the wider the size of the leak, the more drop in pressure that is observed. The experimental results obtained showed that the performance of the wireless communication device compared satisfactorily with the data logger and successfully detects the location of damage on real pipelines when used for real time monitoring. Using this communication device and an analytics platform, real-time monitoring of pipelines can be carried out from any location in the world on any internet-enabled device.

Keywords: Leakage monitoring, crude oil/gas pipelines, wireless sensor system, internet of things (IoT), real-time monitoring

23. Assessment of wood waste for energy generation in Benin City, Edo State, Nigeria

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Abstract: This research primarily deals with the assessment of wood waste generated during the conversion and processing of logs into sawn timber in sawmills. The study was conducted in six sawmills, selected from Oredo and Egor Local Government Areas in Benin City, Edo State. Reconnaissance survey was conducted on the existing sawmills. Multistage sampling method was adopted for the study. Measurements were carried out in these sawmills six days in a week for a period of six weeks. Data for the study were collected by physical measurement using 15 meters tape and diameter tape to generate data of log length and diameter of all the logs before they were fed into the mills. The study showed that there was no significant difference in the number and volume of logs converted in the sampled saw mills. The mean number of logs converted ranged from 42 to 68, while their mean volume ranged from 26.58 m³ to 44.97 m³. Mean volume of lumber produced in the sampled sawmills were between 15.99 m³ to 24.35 m³ per week. The study also showed that the quantity of wood waste produced in the study area was significant (probability value < 0.05). With generation of mean wood waste volume of 10.59 m³ (in sawmill 3) to 20.62 m³ (in sawmill 1).

Keywords: Conversion 1, Assessment 2, Wood Waste 3

24. Design and implementation of a university smart attendance tracking system using geo-location and IOT

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Abstract: In educational institutions, keeping track of attendance is a crucial duty that frequently requires manual methods, which can be time-consuming and error-prone, in order to automate and improve the accuracy of attendance tracking at universities and colleges, this project describes the design and implementation of a University Smart Attendance Tracking System (USATS). USATS makes use of the geolocation and Internet of Things (IoT) technologies. The IoT and geolocation-based University Smart Attendance Tracking System improves the efficiency, accuracy, and transparency of attendance tracking, thereby enhancing the quality of education at universities and colleges. For tracking users' current locations, this app makes use of Geolocation API. The terms "geolocation" and "longitude" are used to describe a location's position in space. This browser tool for tracking the student's current location is very helpful in the creation of an attendance tracking system. Geofencing is the process of creating an algorithm that compares the current location data with that of the classroom where a class is anticipated to take place within a given amount of time. This research demonstrates how IoT and geolocation technologies have the potential to change conventional administrative procedures in the educational sector. Using precise geolocation technology, instructors are always present in the classroom, avoiding proxy attendance.

Keywords: University, Smart rollcall, Geo-Location, authentication, biometrics, IOT

25. Development of cement stabilized interlocking masonry block cubes using aluminum waste and granite powder

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Abstract: Conventional block are the most elementary building materials in building construction and its cost of production has soared. The rapid growth in today's construction industry has prompted the searching for alternative building materials and

technique that shall lead towards achieving economical, efficient and durable replacement for these conventional blocks. In this research, quarry dust, Aluminum wastes (AW) and sharp sand were used in various percentages to produce block samples which were tested for compressive strength at age 7, 14, 21 and 28 days. Tests on the setting times, particle size distribution, specific gravity and workability were also conducted on the materials and samples respectively. The results showed that Block produced with 78.57 % granite powder, 7.14% aluminum waste materials, 14.29% of cement and 0% of river sand were heavier, denser and 29.73% stronger in compressive strength than the traditional sand blocks. When the percentage of aluminum waste content did not exceed 7.14% AW, the blocks could be classified into medium weight blocks, whereas above 7.14% to 28.57% AW replacement, the blocks produced could be classified as light weight blocks. For the purpose of this study, a block mold of 150 x 150 x 150mm was used under laboratory condition to carry out the research.

Keywords: Cement; mixed; interlocking; gravity; block and aluminum

26. Urea -formaldehyde free particleboards from wood wastes using glutaraldehyde modified cassava starch as binder

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Abstract: Improved, sustainable and eco-system friendly material is the focus to developed material for construction industry, the study evaluated, the physio-mechanical properties of particleboards manufactured from wood solid waste and modified cassava starch (MSC); as reinforcer. The starch was extracted from liquid waste from cassava processing and dried into powder form, modified with 24% glutardialdehyde solution. Density of boards, thickness swelling (TS) Water absorption (WA); modulus of elasticity (MoE) and modulus of rupture (MoR), were evaluated according to ASTM standards respectively. Density of boards were recorded 0.22 to 0.58g/cm³, TS and WS recorded are 2 to 24h immersion, 1.6 to 67.30% and 31.6 to 140.4%. MoE and MoR, with peak of values 533.5N/mm² and 35.7N/mm². The microstructural and elemental analyses of boards were examined with Scanning electron microscope (SEM) and Fourier-transform infrared spectroscopy (FTIR); SEM analysis showed granules of modified cassava starch on the surface of the boards, while FTIR showed presence of ester and aldehyde forms attributed to hydroscopic formation of MCS binder. Particle board manufactured from MCS binder exhibited properties suitable for non-loading bearing capacity with reference to unmodified particleboards.

Keywords: wood fiber, modified cassava starch, mechanical properties microstructure.

27. Physio-mechanical properties of cement bonded particle board (CBPB) manufactured from three (3) wood species in Cross River State, Nigeria

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Abstract: The study was designed to evaluate the physical and mechanical properties of the Cement Bonded Particle Board (CBPB) produced from the residues of three indigenous trees species in Cross River State, Nigeria with sole aim that, the wood waste generated in sawmills can be as an alternative material in particleboard industry. The species were, Achi-gum (*Brachystegia eurocoma*); Rubber (*Hevea brasiliensis*) and white afara (*Terminalia superba*). Production of the board was carried out systematically. A mixture of 1:1:1 (500g of wood-flour, 500g of cement and 2 litres of water) was used. Boiling, Blending, Chemicalization respectively; Moulds and mat were formed. Pressing was carried out at 50kN. Finally, CBPB was produced. The physical properties of the boards: for Moisture content: *Brachystegia eurocoma*= 34.7%, *Hevea brasiliensis*=34.6% and *Terminalia superba*=28.6%, Density: *Brachystegia eurocoma* =0.948g/cm³, *Hevea brasiliensis*=0.886g/cm³ and *Terminalia superba* 0.854g/cm³. Water absorption: *Brachystegia eurocoma*=58.9%, *Hevea brasiliensis* 57.9% and *Terminalia superba*=0.8%. For the mechanical properties: Compressive strength for *Brachystegia eurocoma*=19.73N/mm², *Hevea brasiliensis*=19.84N/mm² and *Terminalia superba*=22.6 N/mm². Modulus of rupture: 1.73, 2.83 and 1.66 N/mm² respectively. The particle boards manufactured was dimensionally stable with low absorption and swelling rate. The strength properties were low and not comparable to other boards as read in literature. This result shows that residues of the endemic tree species could be used for particle board production and also waste in the wood-based industries could be turned to wealth creation. Further research should be carried out for panel production with rubber residues that can be more structurally stable.

Keywords: Wood properties, brachystegia eurocoma, hevea brasiliensis, terminalia catarpa, wood waste.

28. Energy Consumption and Carbon Emissions in the Nigeria's Household Sector

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Abstract: In this study, decomposition analysis was carried out on energy consumption in the household sector. The result indicates the changes in the level and structure of energy consumption in Nigeria's household sector between 2000 and 2018, as the total fossil energy consumption grew at an average annual rate of 0.29%. Consequently, the energy consumption increased from 7.55×10^{-6} Mt in 2000 to 4.41×10^{-4} Mt in 2018 (about 57.4%) with a cumulative average of 1.22×10^{-4} Mt. Therefore, fossil energy usage increased. The energy mix (Petrol, Diesel and Kerosene) maintained a stable trend from 2000 to 2009. Still, between 2010 and 2014, diesel utilization increased from 1.13×10^{-4} Mt to 1.75×10^{-4} Mt (55.35%). Petrol utilization increased by 2.61×10^{-6} Mt in 2000 to 1.69×10^{-4} Mt in 2018 with an annual growth rate of 63.9%, as kerosene experienced an increase in usage by 1.94×10^{-6} Mt in 2000 to 5.65×10^{-5} Mt in 2018. Generally, between 2000 and 2018, energy consumption derived from diesel gave the highest share of utilization at 71.10%, followed by petrol and kerosene at 16.74% and 12.16%, respectively. The decomposition results during the time interval (2001-2006) showed negative effects of AHHS and FM on CO₂ emissions in 2000-2003, overriding the positive effects of HHS, PCI, EI and CEC.

Keywords: CO₂, Energy consumption, Household, Fuels, Nigeria

29. Development of a self-governing system for optimal navigation of unmanned ground vehicles in dynamic path

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Abstract: This paper presents a self-governing navigation system using deep reinforcement learning approach, to address the navigation limitation of self-driving vehicles. Which is a remedy to accidents caused by poor regulation of velocity, and inapt navigation in critical road network. It does so by utilizing an improved proximal policy optimization (IPPO) algorithm based on actor optimal function (AOF), which enhances the proximal policy to achieve an optimal reward in situations of scarce rewards, improved sample efficiency, and stabilize the training process. A novel deep neural network is developed to address the problem of low dimensionality related to conventional reinforcement learning algorithms. The algorithm is trained and tested in three driving cases (U-turn, S-turn and L-turn) to determine its navigation capabilities in critical road networks. The effectiveness of the created algorithm is also compared with the conventional PPO reinforcement learning algorithms, and the presented result established the aptness of the developed algorithm in performing apt velocity regulation. This result shows the AOF based PPO capabilities to navigate a self-driving vehicle smartly in dynamic road networks.

Keywords: PPO, AOF, reinforcement learning, Self-driving vehicle

30. Refraction algorithm method for the development of handover transfer channels for GSM networks in Nigeria

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Abstract: This paper presents the refraction algorithm method for the development of handover transfer channels for GSM networks in Nigeria. The algorithm's primary goal is to improve how well GSM networks handle call handovers. The handover of transfer channels for the GSM network algorithm's pertinent mathematical models is presented. Using the python software, a simulation program for the handover refraction algorithm was created. The maximum number of calls a base station can support was set at 20 calls and the simulation software was executed with the refraction time set at 0.080ms. Then, a number of simulations were run for scenarios with no calls in the network and calls in the network from 20 to 100. According to the findings, all calls at base stations with less than or equal to 20 calls were successfully handled without being refracted. However, the handover refraction

algorithm distributed the calls of over 20 to the next base transceiver station in the area of challenges where the number of calls in a base station exceeded 20. With a predetermined handover time of 0.080ms, the handover refraction algorithm routed calls of over 20 to the nearby base station. The handover refraction algorithm specifically refracts 20 calls for every 40 incoming calls to the base stations, 40 calls for every 60 incoming calls to the base stations and continues to 100 calls for every 80 incoming calls to the base stations

Keywords: Handover transfer channels, global system for mobile communications (GSM), networks, refraction algorithm, base transceiver station (BTS)

31. Development of a Low-Cost Slider-Crank Apparatus for Teaching Purposes

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Abstract: The slider-crank apparatus is a significant device for demonstrating the conversion of rotary motion to reciprocating linear motion in laboratories and workshops. It is the basic mechanism used in diesel and gasoline internal combustion engines, these machines play an indispensable role in modern technology. However, the exorbitant cost of these devices has limited their availability for students' use. This study therefore reported the utilization of sustainable engineering in the development of a low-cost prototype slider-crank mechanism for instrumentation in the laboratory. Locally available materials were utilized in the development of the apparatus and evaluation performed following standard test procedures. Experimental results obtained from the apparatus Parameters measured include slider displacements, crank angles, velocity and acceleration for a crank angle of 0° to 90° in the clockwise direction at angular intervals of 15°. Analytic results obtained with the use of design equations are comparable to literature values. The dynamics of developed apparatus compared favourably with imported devices. Observed strokes of the developed apparatus are similar to the strokes of conventional apparatus with higher output torque.

Keywords: Mechanism, slider-crank, apparatus, acceleration, displacement

32. The transformative role of artificial intelligence in smart energy transition for unprecedented energy sustainability in Nigeria

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Abstract: In the face of an impending global energy crisis and the imperative to combat climate change, the integration of artificial intelligence (AI) into the energy sector stands as a seismic shift in the way we approach energy sustainability. This study embarks on a comprehensive journey into the profound and multifaceted role of AI in catalyzing the smart energy transition. Cases studied include; Sustainable buildings and energy consumption, AI-based DSSs for sustainable urban water management, climate artificial intelligence (climate informatics), agriculture 4.0 and sustainable sources of energy, convergence of IoT & AI for sustainable smart cities, AI-based evaluation of renewable energy technologies, and AI for energy optimization. It further delves deep into how AI is revolutionizing renewable energy generation, grid optimization, demand-side management, and carbon emissions reduction, and even envision the path forward, including the ethical and regulatory frameworks that will shape this transformative journey in Nigeria and its environs.

Keywords: Artificial intelligence, smart energy, energy sustainability, energy transition

33. Evaluation of pathloss exponential of NTA Port Hacourt signal strength within Calabar metropolis

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Abstract: This paper focuses on the evaluation of the pathloss of the signal strength of Nigerian Television Authority (NTA) Port Harcourt (PH) 245MHz, within Calabar Metropolis, Cross River State. It was carried out using the Python programming tools incorporated with digital modules of the Community Access Television (CATV) analyzer having 24 channels connected to the antenna of about 6m high above the ground with a gain of 20dB, to determine the signal strength and calculate the pathloss using MATLAB. The signal strength of NTA PH were obtained from twenty-five (25) strategic points within Calabar. Each point forming the Northings and Eastings of the signal transmitted. The mean signal strength within the Calabar Metropolis was determined and compared with the established 21.17 ± 3.33 dB. The location of best reception was determined within Calabar. This study shows that tall buildings, tall trees, high hills and deep valleys affects signal transmission of NTA PH within Calabar. The correlation between the measured pathloss and the distance of separation from the transmitter was determined and this had positive Pearson correlation coefficient of 0.3226. Moreso, the Okuruma, Cost 231 Model, Standard University Index model, Log Normal and the Hata Model were used to predict the outcome of this signal strength within Calabar. This model adopted was the ECC 33 model. Thus, the path-loss exponent for Calabar Metropolis was calculated based on the available collected and collated data.

Keywords: Pathloss, signal strength, signal strength, measured model, Calabar metropolis

34. Design and construction of microcontroller-based programmable DOT matrix information display system

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Abstract: This project presents the design and construction of microcontroller-based programmable dot matrix information display system. The advert system that displays information based on a specific purpose. The system is designed to enable the viewer know an information. The system comprises of different blocks of functional circuits that are put together to achieve the desired aim. These blocks include the power supply section, the control section, the demultiplexer section and the display unit. The power supply unit is the section of the system that ensures that the system is turned ON and this section comprises of a 12-volt step-down transformer, a bridge rectifier circuit, a smoothing capacitor and a voltage regulator IC. The control section is in charge of interpreting the changes that occur in the environment, this section controls the function of all other parts of the circuit. The concept of LED dot matrix display system based on microcontroller, a matrix of light emitting diodes and three segment displays was achieved within this project. The prototype of the display consists of 512 Light emitting diodes wired in rows and columns to achieve a dot matrix formation, each consisting of a 32x16 LED matrix, therefore the design and implementation of moving message display based on microcontroller was adopted. In operating this device and the results achieved, users have the flexibility to choose from various display modes, including static, scrolling, and interactive modes. Activation is as simple as pressing a power button, and users can control the system through an intuitive user interface. This comprehensive operational framework ensures user-friendliness, adaptability, and real-time engagement with the device, making it suitable for a wide range of applications.

Keywords: LED (Light Emitting Diode), Dot matrix, microcontroller, signal, display, information

35. Speed control of DC motor using PWM technique method for industrial applications

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Abstract: This study aim is to investigate the dynamic performance of a separately excited DC motor fed by Chopper for its efficient Speed control. The study adopts Pulse Width modulation technique. Separately excited DC motor model is modeled using armature control scheme, and the DC-DC Buck converter is designed to control the speed of the motor and the model is implemented in MATLAB/SIMULINK software. The speed of the motor is feedback and is compared with the reference speed, PID controller is used to evaluate the error, and the Pulse Width Generator block then converts this signal into trains of pulses which trigger the Chopper (IGBT) of buck converter. The Chopper Switching duration determine output voltage of the Buck converter, which also supply voltage to armature winding of the motor, Since motor speed depends on the armature voltage in armature control scheme, The variable speed operation is implemented and speed of the motor is successfully regulated. The performance of the PWM control method is evaluated using variable load condition, Reference speed tracking is tested with the help of PID controller and transient response to reference speed is evaluated. From the simulation results show that PWM control method provides excellent and efficient control the DC motor and is recommended for Industrial application where variable speed operation is utilized.

Keywords: PID controller, DC-DC Buck converter, DC motor

36. Modeling and simulation of proposed Nigeria bus networks with high penetration of hybrid renewable energy for Nigeria future energy sustainability and economic development

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Abstract: Constant network, system collapse and inadequate energy supply to the user connected to the network leads to the increase in the cost of energy supply by utility companies. The aim of these paper is to model a 74-network using ETAP as a simulation tool for analyzing the impact of the hybrid renewable energy on the network for the country energy sustainability. The reliability of the energy on the network is the priority on the penetration of the solar PV and wind energy. The hybrid gives a better improvement on the network by increasing, improving and power optimization on the network thereby dispatching economically. The inclusion of the hybrid renewable energy to the network results to a stable electrical power on the network, reliable and affordable. Due to the high penetration of the renewable energy to the network, energy supply has improved, affordable, reliable and stable. There is an increase on bus voltages on the network and generally voltage increase. This will help improved the nation economy and sustainable development will be achieved.

Keywords: Renewable energy, penetration, power stability, economic importance and development.

37. Nollywood movie sequences summarization dataset for machine learning applications

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Abstract: Summarization in recent time has become one of most exploited area of natural language processing task, due to significant increase in data volume which is more than terabytes and petabytes. In this article, we present a custom dataset for Nollywood movie sequences, an extensive collection of 13 Nollywood movies representing various genres, including drama, comedy, action. This custom dataset was impendent into pre-train benchmark dataset TV Sum following the same file format, frame size and others in order to suit our purpose. Fast Forward Moving Picture Expert Group (FFMPEG) were used for video encoding during pre-processing and final skimming. The proposed framework is effective for creating movie summary with high user satisfaction rate and having reasonably low computing requirement.

Keywords: Nollywood, movie, machine learning, summarization dataset

38. Modelling UNICROSS Calabar campus electricity distribution network for power quality improvement using capacitor bank

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Abstract: The power system networks are experiencing growing pressure due to rapid industrialization and population expansion. This strain on the power infrastructure results in increased reactive power consumption by transmission and distribution lines. The inductive nature of these lines causes voltage to drop at the receiving end, negatively impacting consumers and generator performance. To address this issue, this study proposes the use of capacitor banks to mitigate reactive voltage drops and enhance power quality. Load flow analysis employing the Newton-Raphson method is conducted with and without capacitor banks, using the initial system state, which includes load, generation, and mismatch parameters. A comparative evaluation reveals a significant reduction in Mismatch MW when capacitor banks are added, indicating successful alleviation of excess generation issues. The results show that the capacitor banks effectively remove 156 kVA of reactive power from the system, resulting in cost savings and substantial power quality improvement. These capacitor banks rectify undervoltage conditions, ensuring stable and efficient distribution system operation. In conclusion, this study underscores the pivotal role of capacitor banks in enhancing power quality, reducing excess generation, and maintaining distribution system stability. The findings confirm the effectiveness of deploying capacitor banks as a viable solution for power quality enhancement in the face of mounting stress on power systems.

Keywords: Power system networks, Capacitor banks Power quality, Load flow analysis, Newton-Raphson method

39. Design and simulation of the 8th order active low pass

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Abstract: The design and simulation of an 8th-order active low-pass filter is a significant advancement in the field of electronics and signal processing. This study focuses on developing a high-performance, low-noise, and efficient 8th-order filter. The filter's transfer function is derived by cascading four second-order Sallen-Key filter stages. Simulation tools, such as MATLAB/Simulink, are used to create a virtual prototype of the filter and evaluate its performance. The study presents comprehensive results through detailed frequency response analysis tools like Bode plots, step plots, impulse plots, and Nyquist plots. Bode diagrams reveal a sharp cutoff frequency of 1kHz and high stopband attenuation, while step response analysis indicates a rapid rising time and settling time. Impulse response analysis confirms smooth decay, a high Q-factor, and a sharp cutoff frequency. Nyquist plots validate expected behavior. The transfer function, supported by MATLAB code, offers a mathematical representation, and LTSPICE results indicate a magnitude of 16.2 dB at 10 Hz and 12.9 dB at 100 Hz. The successful design and simulation of an 8th-order active low-pass filter is promising for various applications like telecommunications, audio processing, and instrumentation. The study underscores the significance of modern simulation tools and rigorous engineering analysis in developing complex electronic circuits.

Keywords: Filters, low-pass, 8th order, MATLAB

40. Actor-critic modulation index controller for improved power factor of slip energy recovery drive

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Abstract: Poor power factor has been projected as the most limiting factor of the slip controlled Wound Rotor Induction Motor also known as Slip Energy Recovery Drive (SERD). Despite its slip energy recovery capabilities. However, the limitation of poor power factor in the performance of SERD constitutes torque pulsation, misfiring, high investment cost and so on. Thus, making it inapt in applications that require improved power factor and optimum drive performance, resulting from significant reactive power and in-rush current harmonics drawn by the inverter on the dc-link. This paper presents an intelligent Modulation index-controlled system using policy improved proximal policy optimization (IPPO) algorithm and a space vector pulse width regulated boost chopper. This policy improved proximal policy optimization algorithm examines and adjusts the drive speed and power factor through the feedback channel and manifest intelligent pulse width switching aptitudes on the boost chopper. This made use of Insulated Gate Bipolar Transistors (IGBT) as a boost chopper switch, and IGBT bridge inverter as the ac means recovery inverter. Switching aptness being a necessity in balancing the dc-link ripples, the actor-critic is hybridized with a callback in the algorithm training sessions, after every training timestep of 200 in a total time step of 1,000. This was simulated on Matlab SIMULINK, and compared with the Traditional SERD under fuzzy logic-controlled schemes. The simulation shows that the intelligent reinforcement learning controller could achieve improved power factor at all load torques, with a balance current and voltage waveform than the fuzzy logic-controlled schemes.

Keywords: SERD, actor-critic, slip power, DC-link, power factor

41. Design and construction of a UAV air to ground autonomous channel system

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Abstract: Unmanned Aerial Vehicles (UAVs) have soared beyond traditional boundaries, transforming industries with their unparalleled versatility. At the heart of their operational prowess lies the pivotal UAV air-to-ground channel system—an intricate network that enables seamless communication between airborne vehicles and their ground control stations. Security emerges as a paramount concern, given the sensitive nature of the data transmitted. This paper delves into the forefront of UAV air-to-ground communication, presenting an overview of key components, challenges, and groundbreaking advancements. The UAV air-to-ground channel system is the lifeline of mission-critical data transfer and real-time control. Comprising transceivers, antennas, modulation techniques, and sophisticated algorithms, this communication nexus ensures the fluid exchange of information. The dynamic nature of UAV operations, characterized by varying altitudes, speeds, and environmental conditions, underscores the need for adaptive technologies. Innovative antenna designs, beamforming strategies, and frequency modulation solutions are used to navigate these challenges. This ensures a resilient and uninterrupted communication link. The system is integrated with artificial

intelligence algorithms, which fortifies security measures, providing advanced threat detection and mitigation capabilities. This work is designed and displayed and the smart UAV capabilities are realized with seamless air-to-ground information communication.

Keywords: UAV, Autonomous, Mission Planner, Simulation, Design, Aerodynamic and Surveillance

42. Analysis of rainfall and temperature over a sub-basin of Lake Chad, Nigeria

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Abstract: Rainfall and temperature are two climatic variables that are indispensable for climate variability and change studies. This study aims to examine the trend pattern of rainfall and temperature over a sub-basin of Lake Chad Hydrological Area. To achieve this, rainfall and temperature datasets over 50 years (1970-2020) were analyzed for variability and trends using descriptive statistics and Mann Kendal Trend Analysis. The results showed that the area has experienced a mean annual rain fall of 751.13 mm yr⁻¹ with a standard deviation of 136.58 mm yr⁻¹. Rainfall variability was high (CV >30) in the early rainy but less (i.e., CV <20) in the annual and late rainy season. The highest mean value was noted for TMIN, TMAX and TMEAN in the months of April and May and their highest variability was in the months of January and February. Also, an increasing trend in rainfall pattern that is significant (p<0.05) had been recorded in the late rainy season and annual timescale. Except for the TMAX (i.e., the day temperature) that showed an upward but non-significant trend, the remaining temperatures (TMIN and TMEAN) showed upward trends of varying levels of significance on seasonal and annual bases. This implies that the area has been experiencing a warming trend with effects on rainfall that has probably attracted the flood witnessed in part of the Lake Chad Hydrological Area.

Keywords: Rainfall, temperature, trend, variability

43. Performance evaluation of laterite crushing machine for sustainable housing delivery in Nigeria

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Abstract: Laterite is a soil and rock type rich in iron and aluminum and is considered to have formed in hot and wet tropical areas. Almost all laterite is rusty-red in colour because of the presence of high iron-oxide content. This material is used in building blocks, road construction, waste water treatment and in some cases for agricultural purposes. The Nigerian Building and Road Research Institute (NBRRI) has been involved in series of research works on effective utilization of lateritic soil such as the development of an Interlocking Compressed Stabilized Earth Block (ICSEB), which is produced from laterite stabilized soil. In the production of interlocking block, there is need for the laterite to be crushed into the required particle size before mixing it with Ordinary Portland Cement (OPC) and water for onward production of the block. In view of the above and the need to eliminate manual sieving, increase production, reduce wastage and production cost reduction, thus a laterite crushing machine was designed and fabricated. The performance evaluation of the fabricated laterite crushing shows that, the machine has a crushing capacity of 22 tonnes per eight hours, grinding efficiency of 93%, and crushing velocity of 11.4m/s with particle size range of 0.6mm to 0.075mm which indicates an improved surface area.

Keywords: Laterite, crushing, efficiency, performance, size

44. Investigation of electromagnetic radiation from CRUTECH electric power substation

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Abstract: The aim of this study is to empirically quantify the electric field intensity and the associated magnetic field strength emitted from an injection sub-station and compare results with the generally accepted safety standards such as the International Committee for Non-Ionization Radio Protection (ICNIRP) Standards. For the purpose of this study, We adopted the method of obtaining measurements using appropriate Instrumentation and Employing computational capabilities in order to simulate the propagation environment for easy analysis. MUSTOOL (MT525) Electromagnetic radiation meter a portable field survey instrument that conforms to international standards was used. The switch yard was modelled as a rectangular box, while measurements were taken at specific locations around the box. These locations were sixty in number each having their

corresponding x and y axes. At each point, measurements were obtained at three different heights of 1m, 1.5m and 1.75m at each point. But preliminary measurements showed that the Electric field was constant at all these heights. The magnetic field strength measured at a height of 1.5m, 1m, and 1.75m, had a maximum value of 54 μ T, 57.699 μ T, and 29.93 μ T, respectively. The Electric field intensity measured at a height of 1.5m peaked at 0.293kV/m. Contour plots show areas of interest in this investigation. It was noticed that the contour lines increase inwards. This indicates a buildup of magnetic field or electric field at these areas of interest. This was further buttressed by the surface plots, which highlights these areas of interest as elevations on the surface. When compared to the generally acceptable safety standard for public and occupational exposure to power-frequency EMFs. These values were less and within the limit recommended by International Commission on Non-Ionizing Radiation Protection (ICNIRP).

Keywords: Electromagnetic radiation, electric field, magnetic field

45. Characterisation and utilization of coir fibre as reinforcement for geopolymers composite

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Abstract: Geopolymers are sustainable alternatives to Ordinary Portland Cement (OPC) and have been in existence for some decades. The usage of coir fiber as reinforcement for metakaolin-based geopolymer binders is examined in this work. Here, process optimization study was carried out to develop a consistent method producing the geopolymer binder. NaOH and Na₂SO₃ were used as alkaline activators for the binders while fibre volume fractions of 0.03, 0.05, 0.07, 0.1 and 0.12 were used for the mix design. Elemental and mineralogical characterisation was carried out on the kaolin and coir fibres with the aid of an x-ray fluorescence analyser and x-ray diffractometer. Compressive tests on all samples at 28 days showed an optimum of 14.91MPa for the 0.1 fibre volume fraction while an optimum flexural strength of 3.53 was achieved for the 0.07 fibre volume fraction. A good interfacial adhesion between the fibers and the matrix was also revealed by Scanning Electron Microscope (SEM) analysis. The present study investigated the potential for developing a sustainable geopolymer technology by utilizing locally available coir fibre. Utilizing coir fiber has benefits including affordability and sustainability. The geopolymer binders produced showed comparable strengths to OPC and would be suitable as construction materials for less critical applications. The optimization of fiber composition and long-term durability can be studied further.

Keywords: Characterisation, coir fibre, composite, geopolymer, reinforcement

46. Biodiesel a sustainable fuel: exploring the feedstocks and production process

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Abstract: The imperative for a sustainable fuel source to mitigate the challenges posed by climate change, utilizing agricultural, industrial, and domestic waste, is of paramount importance. This study delves into biodiesel as a viable sustainable fuel, investigating both its feedstock options and production processes. The analysis encompasses the progression of feedstock generations from first to fourth, while also scrutinizing biodiesel production methodologies, such as batch processing, esterification, transesterification, direct blending, micro emulsion, and pyrolysis. The research expounds upon the versatile applications of various feedstocks and production techniques within biodiesel synthesis. Transesterification emerges as the most cost-effective, accessible, and widely employed method due to its ease of access to requisite materials. Notably, biodiesel, derived from biodegradable feedstocks, exhibits commendable yield and properties, rendering it a clean, renewable, reliable, environmentally benign, and economically feasible alternative compared to conventional diesel, which experiences substantial cost escalation. Consequently, conventional diesel poses a substantial threat to the environment and exacerbates energy insecurity. Furthermore, biodiesel and its blends demonstrate superior applicability as automotive fuel sources, affirming their potential as a promising alternative.

Keywords: Biodiesel, feedstock, transesterification

47. Modeling and evaluation of Calabar transmission line network for load flow and transient stability for future grid expansion

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Abstract: The Calabar transmission network, which consists of 41 buses and 56 lines, was subjected to load flow studies and transient stability analyses. During a standard simulation of load flow analysis, buses 9, 50, and 54 had voltages of 66.681%, 66.96%, and 66.655, respectively. However, after compensating the afflicted buses, the voltages on these buses improved by 16.89%, resulting in 96.112%, 98.887%, and 103%, respectively. Without compensators, the total network losses during normal load flow simulation are 16.511MW and 4004.872 mvar. When compensation is applied, the overall network losses increase to 19.211MW and 2348.110 Mvar. Some transient cases were examined; these cases are 3-phase faults on bus 3 at 5 seconds. 50% fault on line 34 cleared after 15 seconds. ETAP 19.0 is utilised as a simulation tool since it has a superior network analysis performance. The purpose of this article is to analyze the Calabar transmission line network, with the results being used for effective planning and extension for energy sustainability. This work is being done in response to the energy issues in the area in order to improve performance and coordination. The Newton Raphson technique of load flow is being investigated for the job because of its advantages of better and shorter iteration to solution

Keywords: transient stability, load flow, power system stability, transient stability methods.

48. Design and development of e-learning for the Department of Electrical and Electronic Engineering, University of Cross River State (UNICROSS)

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Abstract: The increasing demand for distance education and the rise of wireless telecommunications networks have opened new possibilities for the implementation of e-learning platforms. This project is focused on the design and development of an e-learning system specifically tailored for wireless telecommunications networks. The objective is to create a user-friendly and interactive platform that enables students to engage in remote learning experiences related to wireless communication technologies. The project includes the analysis of current E-learning methods and wireless telecom networks, covering various e-learning platforms, instructional design, mobile learning, and wireless communication systems. Its aim is to create an engaging learning environment by utilizing wireless networks, integrating multimedia, interactive simulations, and real-time communication tools. The project also includes the design of assessment modules for student progress tracking and feedback. Throughout the project, feedback from both lecturers and students were gathered through surveys and usability tests to ensure that the platform meets their needs and expectations. The result of the project is a functional prototype of the e-learning platform, ready for deployment and evaluation in a real educational setting. The potential impact of this project is significant by leveraging the power of wireless telecommunications networks; thus, the e-learning platform can provide students with access to educational resources and interactive learning experiences from anywhere and at any time.

Keywords: Internet of things, Electroencephalography, Machine learning, Students performance measurement, Visual learning.

49. Design and simulation of a hand motion remote control system using sensor-based technology

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Abstract: This study explores the design and simulation of a hand motion remote control system utilizing sensor-based technology and microcontrollers. The primary objective is to assess the viability and effectiveness of a hand motion remote control system capable of performing fundamental functions, such as adjusting volume or changing channels through intuitive hand movements. The research focuses on both the design and simulation aspects of the system, offering a comprehensive evaluation of its capabilities. At the core of this simulation, we incorporate a combination of gesture, accelerometer, and gyroscope sensors, empowering the system to detect and decipher hand movements with precision. These hand movements are converted to electrical impulses by the microcontroller using digital signal processing and then seamlessly translated into precise commands that govern various electronic devices. In contrast to conventional remote controls with their reliance on physical buttons and complex interfaces, this system offers a more user-friendly and intuitive alternative. The simulation tool used in carrying out this project

work was the proteus 8 professional environment. The simulation code was written in Arduino Integrated Development Environment (IDE) using the Arduino programming language which is a variant of the C++ programming language. The results underscore the efficiency and precision of the proposed system, demonstrating its capability to reliably control a wide range of electronic devices through straightforward hand movements.

keywords: Hand motion remote, control system, gyroscope sensors, sensor

50. Microstructural developments in plain and slag-blended cements

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Abstract: The microstructures of cement systems such as pastes, mortars and concrete control other physical properties such as strength, transport properties and durability. The microstructure of cement is made up of hydrated and anhydrous phases, including pores containing pore water. This study investigated changes in the microstructures of plain and slag-blended cement pastes from 7 to 28 days. These were achieved using scanning electron microscopes (SEM) – backscattered electron (BSE) images. Two slags (S1&S2) were blended with CEM I 52.5R at 30% and 70% replacement. These were compared with plain CEM I 42.5R for microstructural developments. X-ray diffraction (XRD) was used to follow patterns of hydration products. The results for plain cement pastes show more coarser microstructure at 7 days than 28 days, indicating refinement as hydration progressed. In the slag blends, unhydrated Portland cement clinker grains were scarcely present after 28 days of hydration. Less presence of calcium hydroxide and more outer product calcium silicate hydrate were observed in the slag blends. Hydration of plain cement at 20°C increased between 7 and 28 days, from 74% to 79%, while the weighted hydration of the slag-blends at 20°C increased from 50% for 70% slag-blend, to 85% for 30% slag blend.

Keywords: Cement, Hydration, Microstructure, Slag

51. Modelling and simulation of an adaptive gain PID controller for a direct torque fuzzy speed-controlled induction machine drive

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Abstract: The ongoing industrial revolution has increased the use of induction motors in various approaches to process control, optimization, and prediction. The direct torque controller (DTC) is an interesting control scheme for induction motor control. It is suitable for variable-frequency drives for torque and its consequent speed control, specifically for the calculation of the estimated Induction motor's magnetic flux and torque based on the motor's measured voltage and current. However, this scheme has a disadvantage in its implementation that makes it unsuitable for high torque applications, resulting in poor drive parameter variation, optimization, and dynamic responses when compared to field-oriented control (FOC). Fuzzy-based DTC is introduced to control. The high torque ripple nature of the direct torque controlled induction motor, improve drive performance to parameter variation, and improve transient response to step changes in torque during start-up.

Keywords: Direct torque control (DTC), Neural Network (NN), Fuzzy Logic Control (FLC), induction motor

52. Assessment of quality of tanker vended water in Enugu metropolis

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Abstract: Twenty water samples were collected from tanker operators and household storage tanks. Seventeen physicochemical and two microbiological parameters were tested according to standard procedures. Colour, pH, conductivity, TDS, temperature, nitrate, chloride, sulphate, alkalinity, total hardness, calcium hardness, magnesium hardness, calcium, potassium, sodium, iron, total coliform and E.coli were tested and compared with the World Health Organisation (WHO) and Nigerian Industrial Standard (NIS) drinking water guidelines to ascertain whether there is violation. It was observed that there was no violation in the physicochemical parameters except in 40% of the samples for pH. Also, there was 30% violation for total coliform and E.coli. Pearson's correlation was applied on the water quality data to ascertain whether there are significant relationships between the

tested parameters. Principal Component Analysis (PCA) and Cluster Analysis (CA) were applied on the data to know the sources of contamination of the tanker supplied water. Results of the analysis showed that contaminants enter into the tanker supplied water through influence of anthropogenic activities on groundwater chemistry, poor hygiene during the collection, transportation of water by tanker operators, interaction between groundwater and geological formations and leaching of iron into the water as a result of interaction between the tanker material and water. Treatment of the water is recommended before use to avoid the risk of exposure diseases.

Keywords: Tanker vendors, water quality, water supply

53. Positive environmental impact of biodiesel as an alternative fuel

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Abstract: This research investigated the emission impact of biodiesel in contrast to conventional diesel using a diesel engine test bed. The findings revealed that diesel engines fired with biodiesel and its blends exhibited reduced emissions of CO₂, CO, and exhaust smoke when compared to standard diesel. At a brake power of 2kW, B100, B10, B20, B30, and B40 demonstrated CO₂ emissions of 3.21%, 4.11%, 4.36%, 4.69%, and 4.81%, respectively, in comparison to diesel's emission rate of 4.97%. Additionally, CO emissions for these biodiesel blends were recorded at 0.06%, 0.12%, 0.13%, 0.17%, and 0.2%, respectively, in contrast to diesel's 0.2%. Furthermore, the levels of exhaust smoke observed for B100, B10, B20, B30, and B40 were 40%, 56%, 54%, 53%, and 42%, respectively, compared to diesel's 64%. These results underscore biodiesel as a promising alternative to conventional diesel, showcasing notable advancements in reducing both greenhouse gas and air pollutant emissions. Ongoing developments in feedstock sourcing, production technology, and sustainable practices further enhance biodiesel's potential. By offering substantial environmental benefits, biodiesel emerges as a pivotal solution in addressing environmental concerns while simultaneously contributing to bolstering energy security and diversification.

Keywords: emissions, biodiesel, environmental impact, feedstocks

54. Sequence analysis of heat resistant gene in naked neck Nigerian indigenous chicken

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Abstract: This study analyzed and evaluated the sequence of Heat shock protein resistant genes in heat resistant Naked Neck Nigerian Indigenous Chickens (*Gallus domesticus*). The Naked Neck (NN) Nigerian Indigenous Chicken is a rare breed with a distinctive genetic characteristic of heat resistance. This trait, allows the chicken to flourish in Nigeria's typical hot and muggy climate. The ability of these chickens to withstand high temperatures with no adverse effects on their health and productivity makes them ideal as species of interest in the local poultry industry. The sequencing data and properties of the heat-resistant genes HSP25, HSPD1, HSPA5, and HSPA2 in the NN species of chicken were examined using Computational and Bioinformatics techniques. Amino acids and DNA sequences for the heat-resistant genes were sourced for and retrieved from the National Center for Biotechnology Information (NCBI) gene bank using the FASTA format and Basic local alignment search tool (BLAST). Guanine-Cytosine content, secondary protein structures, domain architecture and physicochemical properties were all determined using appropriate analytical software. The heat resistant genes polymorphism indices were calculated too. Result of sequence characterization showed high variability. HSP90 had the highest number of 858 (98.84%) polymorphic sites out of 868 loci, HSFP showed 98.72% single nucleotide polymorphisms. Heat shock factor protein HSPB2 showed a total of 563 polymorphic sites out of 573 loci representing 98.28% single nucleotide polymorphisms while the HSP2B showed 481 polymorphic sites out of 491 loci with 97.96% single nucleotide polymorphisms. The Interleukins IL6 showed single nucleotide polymorphisms (SNPs) in 231 (95.857%) polymorphic sites out of 241 loci. The guanine and cytosine contents were thermally and genetically stable with high G-C contents of 48% and above. Instability index of all heat resistant sequences examined was low, indicating the genetic and thermal stability of the heat resistant gene in naked neck breed. These findings present the heat resistance genes as viable options for genetic manipulations in the poultry industry, for sustainability and economic growth and should be harnessed by the Nigerian breeders for the desired purpose.

Keywords: Chicken, gene, heat resistant, sequence analysis

55. Design and implementation of a library management system using python

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Abstract: This research paper presents the design and implementation of a library management system (LMS) in a university library. The aim of the study is to develop a user-friendly and efficient LMS that can streamline library operations and enhance user experience. The methodology used in this study includes a literature review of existing LMS, requirements analysis, system design, implementation, and testing. The system was developed using the Waterfall model and was implemented using open-source software. The results of the study demonstrate that the LMS is effective in managing library operations, improving information retrieval, and enhancing user experience. The LMS was design and implemented using the HTML (Hypertext mark-up language), CSS (Cascading style sheet), JavaScript, Flask (Python web framework) and PostgreSQL database. The study also highlights some of the challenges faced during the design and implementation of the LMS, such as bad user interface of existing system, poor data handling and security bridges. Overall, this research paper provides valuable insights into the design and implementation of LMS in academic libraries, and offers practical recommendations for improving the effectiveness and efficiency of library operations.

Keywords: LMS (Library management system), students, python, modelling

56. Relevance of electromagnetic energy to medical imaging and it effect on health

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Abstract: Electromagnetic energy describes the various energies that travel as wavelengths through space at the speed of light. It is also referred to as EM radiation (Electromagnetic Radiation) which does not have mass or charge. Rather, it travels in a bundle of light energy called photons. It is one of the four fundamental forces of nature and has great impact in the production of medical images. The study is focused on shedding light and providing information on the relevance of electromagnetic energy in medical imaging with proper application for health benefits. In the field of medicine, most diagnosis are derived from images produced from the use of either X-rays, MRI (Magnetic Resonance Imaging) and many other medical imaging equipment. This energy if not properly channeled or regulated can be harmful rather than providing for the right medical purpose. The qualitative research method including secondary data sources and peer-reviewed journal were adopted for the study. Medical imaging has been very instrumental in the field of medicine both to the medical professionals and the patients. This can be achievable as a result of the presence and importance of electromagnetic energy or EM. The application and control of this energy is necessary for a safe and successful imaging procedure.

Keywords: Electromagnetic energy, medical imaging, images, relevance.

57. Analysis of hydraulic performance and flow characteristics in sloping channels with rising floor ends

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Abstract: This study investigates the hydraulic behavior of water flow in sloping channels that feature rising floor ends. The research aims to understand the impact of sloping channel gradients and configurations of rising floor ends on flow patterns, velocity distribution, and energy dissipation. A hydraulic experimental study was conducted on a variable-slope channel measuring 0.2 m in width and 4.0 m in length. This channel featured varying inclinations of rising downstream floor ends at 0.2, 0.3, 0.4, 0.5, and 0.6m; 0.2m in width and 1.0 m in length. The study sought to provide insights into the hydraulic efficiency and energy dissipation capacity dynamics of such channel designs. For a specific slope angle and gently rising floor end, measurements of discharge and water depth were taken, and velocity was derived. The results revealed that energy dissipation, as well as sediment transport, is directly influenced by both the channel slope and the downstream rising floor end. Statistical correlations were established between the length, sequent depth ratio, and the distance of the jump with other independent parameters.

Keywords: energy dissipation, flow velocity, hydraulic jump, sloping channel, open channel

58. Design and analysis of a rectangular microstrip patch antenna for s-band wireless communication systems

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Abstract: Because of the growth of communication devices and systems, frequencies are becoming more suitable for the size and performance of this type of antenna. High dielectric constant materials are employed to accomplish greater size reduction due to recent developments in semiconductor technology, making it particularly helpful and popular in the design of mobile devices and wireless systems. However, microstrip patch antennas have limitations due to their small bandwidth and poor strength. In view of this, a 2.4 GHz rectangular microstrip patch antenna for wireless communication is presented with a substrate flame Retardant (FR4). This material has a thickness of 1.6 mm and a dielectric permittivity of 4.3. The antenna layout is simulated using the CST Studio suite. The result obtained has a lower return loss, higher gain, lower VSWR and a better directivity, and more importantly, an efficient operation within the S-band. The simulation revealed that the return loss, gain, VSWR and gain were correspondingly -27.01 dB, 6.75 dBi, 1.7 dB. The efficiency was 89.56%. It operates efficiently within frequencies 2.3716 GHz – 2.4361 GHz. The results from the simulation is better than the ones done in the recent past when benchmarked with similar designed. It will be efficient for wireless system communication in S-Band at its prescribed range.

Keywords: Microstrip Patch Antenna, CST, Return Loss, Wireless communication, Flame Retardant (FR4)