

KeSEBAE NEWS

NEWSLETTER OF THE KENYA SOCIETY OF ENVIRONMENTAL, BIOLOGICAL
AND AGRICULTURAL ENGINEERS

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Biomedical Engineering: The Urgent Need

Lawrence Gumbo

The recent tragic deaths from cancer of prominent Kenyans, including the Governor of Bomet County, Dr. Joyce Laboso, and the Member of National Assembly for Kibra Constituency, Ken Okoth, has brought to fore the discussion on the need for much improved medical services and healthcare systems in Kenya.

Governor Prof. Peter Anyang' Nyong'o of Kisumu County stated at Laboso's funeral service that there is urgent need to develop local human resource capacities in the medical services area. The focus on building specialist hospitals alone would not solve the problem. Doctors, nurses, laboratory specialists and others are needed in the diagnosis, treatment and management of cancer. This is true of all diseases, communicable and non-communicable.

Kenya must hasten its capacity to address disease from the perspectives of prevention, diagnosis and treatment. This implies the capacity to develop environmental and public health systems and hospital. Also crucial are the development of capacity in research and human resource development through education and training. The building of hospitals and manufacture, installation, operation and maintenance of equipment and machinery for disease diagnosis and treatment need the participation of engineers.

Biomedical engineering is the application of the science and art of engineering to the planning, design and management of systems for health care of human beings. It combines expertise

in engineering with expertise in medicine and human biology to develop technologies and techniques for healthcare and patient care.



Body communication

The field addresses engineering concerns of:

Biotechnology

- Health Care Systems
- Amenity
- Human Biology
- Pharmaceutical industries
- The Environment

The specialization areas of Biomedical and Health Systems Engineering are:

- **Clinical and Instrumentation Engineering**

In this area use is made of engineering principles in the design of computer hardware and software, measurement principles and techniques to develop devices used in the diagnosis and treatment of disease. It combines the design and problem-solving skills of engineering with the medical and biological science to help improve patient health care and the quality of life of healthy individuals.

This area includes therapeutic machines such as x-ray, ultra sound,

MRI, CT- Scan, PET CT, and as scintigraphy. Therapeutic machines include radiotherapy machines. . Also in the area are cardiovascular bioengineering, physiological systems modelling, hearing and speech processing and medical device entrepreneurship.



Biomedical laboratory

- **Biomedical and Rehabilitation Engineering**

In this area engineering principles are used to design, develop, adapt, test, evaluate, apply, and distribute technological solutions and devices to assist individuals with disabilities as well as to aid the recovery of physical and cognitive functions lost because of disease or injury.

Eye glasses, artificial limbs and other prosthetics are in this area. This area also includes regenerative tissue growth, artificial blood, and biodegradable materials. Also in this area are design of assistive and rehabilitation devices, synthetic biology, regenerative medicine, robotics in surgery, telemedicine, biomolecular and cellular engineering, genetic engineering, physiological systems modelling, biomedical stress analysis and optometric engineering.



Biomedical apparatus for scanning

- **Hospital and Health Systems Engineering**

In this area engineering principles and engineering management are used to design, analyze and evaluate various medical production systems, delivery systems, waste control and disposal systems in the hospital, occupational and safety systems and other infrastructure amenity systems in the hospital.

This area includes waste management and pollution control, design of waste management systems, combustion in hospital engineering, landscape engineering, building services engineering, and machinery management, building maintenance, health management systems, hospital management systems and planning of health systems.

- **Public Health Engineering**

In this area the science and art of engineering are used in the design management of wastes control and disposal systems aimed at the prevention and control of disease and disability, environmental management, disease vector control, prolonging life and promoting health and the promotion of physical and mental health of the population.

This area includes water quality analysis, water and wastewater systems design, solid waste management, ground water technology, disease vector control, fumigation and insecticide treatment, ventilation in structures and environmental monitoring and control.

- **Pharmaceutical and Biomolecular Engineering**

In this area, engineering principles, practices, science and technology used for the purposeful manipulation of molecules of biological origin in the production of medicines and medical supplies. It involves the interface of molecular biology, biophysical chemistry aimed at developing and manufacturing products, processes, and components in the pharmaceuticals industries.

This area includes industrial design, powder and particle technology, industry, manufacturing and optimization, pharmaceutical formulation, production planning and control, automation systems, plant design, packaging and materials handling.



Biomedical equipment

Biomedical engineers go through curricula which offer education and training to equip the candidate with the skills that allow for practice as an engineer. Generally, the curricula include general education, communication, mathematics, biological sciences, chemical sciences, environmental sciences engineering sciences, engineering applications, management, economics, law, sociology, psychology, computer science and health and safety.

There are many biomedical engineering degree and diploma programmes offered at many universities and colleges worldwide. In Kenya, Kenyatta University has a programme in Bachelor of Science in Biomedical Engineering. The Technical University of Kenya intends to offer a similar programme soon. The University of Nairobi has plans to renew its decade and a half efforts at offering the programme.

Several learned societies for biomedical engineering exist in many countries in the world. Biomedical Engineering Society, BMES, is an American professional society for students, faculty, researcher and industry working in the broad area of biomedical engineering. BMES is the leading biomedical engineering society in the United States and was founded on February 1, 1968 "to promote the increase of knowledge and its utilization." There are 7,000 members in 2018. Institution of Mechanical Engineers of the UK has a Biomedical Engineering section. Biomedical Engineering of South Africa is four decades old.

Licensing (registration) of accredited degree and diploma programmes is possible in Britain and its former colonies like USA, South Africa, India and Kenya. Biomedical engineers will be vetted by the Biomedical Engineering Board if a bill in the National Assembly is passed. In Kenya, the Biomedical Engineering Bill 2015 was sponsored by Matungulu MP Stephen Mule. It sought to provide a framework for training, registration and licensing of biomedical engineers. The bill went through parliamentary processes but was ultimately not passed. There are reports that efforts are being made to revive the bill.

Biomedical Engineering is a necessary and important branch of engineering. It must take its necessary place in Kenya.

Call for papers

The Kenya Society of Environmental, Biological and Agricultural Engineers invites researchers to submit original research works formatted according to the JEAE format for review and publication

Society Holds Executive Committee Meeting

KeSEBAE held its regular committee meeting on 27 August 2019 at the offices in Westlands, Nairobi to discuss key issues and progress made so far in various fronts. The well attended meeting discussed, among other issues:

- Upcoming Annual Conference
- Lecture series
- CPD Registration and awards
- Fundraising
- Membership recruitment



KeSEBAE Executive Committee Meeting in Progress; Prof. L. Gumbe, Eng. J. Simiyu, Eng. S. Mwamzali, E. Oranga and Prof. A. Gitau

This was a follow-up to a previous Executive Committee meeting held at the Nairobi Club on 18 June 2019



Executive Committee Meeting at the Nairobi Club on 18 June 2019. From Left Eng. Dr. D. Mbuge, Eng. J. Nyaguti, Eng. S. Mwamzali, Eng. Prof. L. Gumbe, Mr. E. Oranga and Eng. K. Makidui

KESEBAE ANNUAL CONFERENCE 2019

Theme: Engineering the Big 4 Agenda

Venue: University of Nairobi Towers

Dates: Thursday 14 – Friday 15 November 2019

Conference Brief

1.0 Background

The Government of Kenya has initiated an ambitious Programme dubbed the Big 4 Agenda. The priority areas under this Programme are: food security, affordable housing, manufacturing, and affordable healthcare for all.

The Kenya Society of Environmental, Biological and Agricultural Engineers (KeSEBAE) recognizes the important role Engineers can play in helping in the achievement of the Big 4. The organizing committee for the KeSEBAE Annual Conference 2019 have therefore zeroed in on nine (9) sub themes that are relevant for the success of the Agenda:

1. Engineering for Food Security
2. Engineering for climate change
3. Engineering the environment
4. Engineering our irrigation
5. Energy for the Big 4 Agenda
6. Engineering our infrastructure
7. Engineering our water and sanitation systems
8. Engineering and technical education
9. Socioeconomics of the Big 4 Agenda

2.0 Call for Papers

The Society wishes to invite for papers on any of the above sub themes. Authors are invited to submit abstracts of their papers to:

Eng. (Dr.) Duncan Mbugue
Email: info@kesebae.or.ke

3.0 Conference Structure

Key note speeches, Platform presentations, Plenary discussions, Poster presentations and Exhibitions

4.0 Payment

The charges for the conference are KSh. 5,000 for regular participants and KSh. 1,000 for undergraduate students. Participants are encouraged to register and submit their presentations and manuscripts way before the conference date

MPESA: PAYBILL; 303030
Account: 2038150696

BANK:
Kenya Society of Env. Bio. & Agric. Engineers
Barclays Bank of Kenya
University Branch
Account: 2038150696

For record purposes, submit all evidence of payment to 0726305273

Person of Interest- Eng. Prof. Ayub Njoroge Gitau

Ezekiel Oranga



Eng. Prof. Ayub Gitau, Dean, School of Engineering, University of Nairobi

Summary

Our person of interest is the Dean, School of Engineering, University of Nairobi. He holds a PhD in Agricultural Engineering and is a Registered Professional Engineer with Engineers Board of Kenya (EBK). Prof. Gitau is the first Agricultural Engineer to be elected Dean of the School of Engineering, University of Nairobi. He is a Lead Environmentalist registered by the National Environment Management Authority (NEMA) of Kenya, a founding member and Vice Chair of KeSEBAE and a member of several learned societies including the American Society of Agricultural and Biological Engineers (ASABE), International Soil Tillage Research Organization (ISTRO). He is a founder member of KeSEBAE and a Council Member of the Institution of Engineers of Kenya (IEK). Prof. Gitau is married with three children.



Eng. Prof. Ayub Gitau outside his office

Background and Education

Prof. Ayub Gitau was born on 20 October 1966 in Nderi village, Kikuyu Sub-County in Kiambu County, Kenya. He attended Komo Primary school between the years 1973-1979 before proceeding to Kahuho secondary school for his "O" levels between 1980 and 1983 where he obtained a Second Division. He proceeded to Makueni Boys High School for the "A" levels and obtained 3 Principles and 1 Substitute that allowed him to proceed to Egerton University. At Egerton University, Prof. Gitau did his undergraduate between the period 1987 and 1990 and obtained an Upper Second Class (Hon.) Degree in Agricultural Engineering with a GPA of 3.4. He then proceeded to the University of Nairobi for his Master's Degree. He obtained his Masters in Agricultural Engineering (Power and Machinery Option) in 1995. Prof. Gitau then embarked on his PhD research in 2001. The University of Nairobi awarded him the PhD degree in 2005.

Work Experience

Prof. Gitau started his work experience at the Kenya Industrial Training Institute (KITI) under the Ministry of Trade and Industry in Nakuru as a Lecturer between 1995-2000. In 2001, Prof. Gitau was employed as the Head of Department of Agriculture and Natural Resources by Kenya Methodist University, Meru Campus, a position he held until 2002. During the same period, 1995-2001, Prof Gitau also did part time lecturing work at the University of Nairobi and at Jomo Kenyatta University of Agriculture and Technology (JKUAT). In 2001, Prof. Gitau became a Lecturer at the University of Nairobi until 2008 when he was promoted to the position of Senior Lecturer. In 2015 he received an appointment as an Associates Professor of the University of Nairobi. He also holds the position of Adjunct Professor in Kenyatta University. Prof. Gitau is also a consultant in the fields of Agricultural Engineering, Environment and Biosystems

Engineering. He is a distinguished researcher who has published widely in these and other areas and has supervised several M.Sc. and PhD research in relevant fields. During his time at the University of Nairobi, Prof. Gitau has served in several positions including Chairman of the Department of Environmental and Biosystems Engineering (2011-2017), Member of the Faculty Post Graduate Committee, Member, Faculty Time Tabling Committee, Chair, College Environment Committee, among others.

Election as Dean, School of Engineering, University of Nairobi

After successfully serving in the above Committees at the School and College levels, Prof. Gitau, in 2018 decided to take his chance by vying for the position of Dean, School of Engineering. This was a tall order given that no one from the Department of EBE had previously held deanship before. He had to win the support of the Faculty both at the departmental level and school level. Prof. Gitau's professionalism together with the network he developed during his service at these levels and the very strategic and organized campaign he put in place won him the Deanship.



Eng. Prof. Ayub Gitau having a discussion with KeSEBAE's Ezekiel Oranga

Vision for the School and the Profession

The School of Engineering, University of Nairobi, has six departments: Civil and Construction Engineering, Electrical and Information Engineering, Environmental and Biosystems Engineering, Geospatial and Space Technology Engineering, Mechanical and Manufacturing Engineering and Petroleum and Chemical Engineering.

The School has a vision of being a *leading centre for the development of knowledge in the discipline of engineering and to inspire through our activities and relationships, in order to raise the standard of life of the people of Kenya and Africa as a whole.* The School has a total student population of about 4,000, the majority (about 3,500) being undergraduate students.

In his election manifesto, Prof. Gitau promised to focus his efforts in the areas of promotion of research, enhancement of training, promotion of consultancy and development of a

vibrant outreach system. He observed that the mentorship programme in existence required a closer review to ensure the school produced scholars that are responsive to society's needs and who are ethical in their practice of engineering.

Prof. Gitau's vision for the school includes the alignment of the school's focus to the Government's Big 4 Agenda. To this end, the School is at an advanced stage in developing an Engineering Complex that will provide a conducive environment for both Faculty and students and improve the

environment for research, innovation and outreach services.

Prof. Gitau is passionate about the growth of Agricultural, Biological and Environmental Engineering in Kenya. In particular he is keen to see the development of Biomedical Engineering in Kenya. He believes that this area of academia carries with it huge opportunities for students of biological engineering and for the growth of the country's health sector.

At KeSEBAE, we wish Eng. Prof. Ayub Gitau the very best

KeSEBAE Lecture Series

The Editor

The KeSEBAE series of lectures for this year are as tabled. **All lectures to be held at the University of Nairobi Towers from 5.00pm.**

Date	Theme	Facilitator
11 September 2019	Irrigation and Water Storage in Kenya	Eng. J. Nyaguti
October 2019	Renewable Energy Resources	Eng. S. Mwamzali
November 2019	Environmental Engineering	E. Oranga
December 2019	Food Engineering	Prof. M. Okoth
January 2020	The Engineering Profession	Prof. L. Gumbe



Call for membership

The Kenya Society of Environmental, Biological and Agricultural Engineers invites interested individuals to register as members of the society.

EDITORIAL

The KeSEBAE NEWS is a Newsletter of the Kenya Society of Environmental, Biological and Agricultural Engineers

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