

# KENYATTA UNIVERSITY



PRESENTATION

COHORT IV ORIENTATION

19<sup>th</sup> SEPTEMBER 2022

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## INTRODUCTION



**Kenyatta University**

**Nairobi, Kenya**

: African Host University (AHU)

**Thematic area:** Minerals, Mining and Materials Engineering

**Program:** PhD (Material Science)

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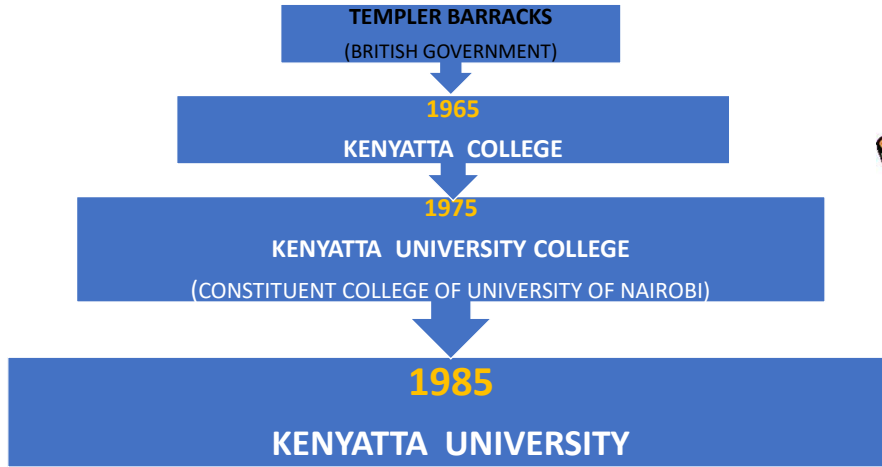


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## Brief History of Kenyatta University



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## Schools at Kenyatta University

- Agriculture and Enterprise Development
- Applied Human Sciences
- Architecture and Built Environment
- Business
- Economics
- Education
- Engineering and Technology
- Environmental Studies
- Hospitality and Tourism
- Humanities and Social Sciences



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# Schools at Kenyatta University



- Law
- Medicine
- Peace and Security Studies
- Public Health
- Pure and Applied Sciences**
- Virtual and Open Learning
- Visual and Performing Arts

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## VISION STATEMENT

"To be a dynamic, an inclusive and a competitive center of excellence in teaching, learning, research and service to humanity. "

## MISSION STATEMENT

"To provide quality education and training, promote scholarship, service, innovation and creativity and inculcate moral values for sustainable individual and societal development."

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# SOME KEY UNIVERSITY FACILITIES

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# EDUCATION AND TRAINING IN MATERIAL SCIENCE

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## School of Pure and Applied Sciences

### Departments

- Biochemistry, Microbiology and Biotechnology
- Chemistry**
- Mathematics, Statistics and Actuarial Sciences
- Physics**
- Plant Sciences
- Zoological Sciences

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# Laboratories



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## Department of Physics



<http://spas.ku.ac.ke/index.php/departments/department-of-physics>

### Active Areas of Specializations

- ✓ Astronomy and Astrophysics
- ✓ Applied Nuclear Physics
- ✓ Electronics and Instrumentation
- ✓ Environmental Physics
- ✓ Geophysics
- ✓ **Materials Science**
- ✓ Theoretical Atomic Collision Physics

### Staff

19 Academic  
18 Ph.D. holders  
10 Technical

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## Material Science Physics



### Academic Staff

- ✓ Dr. Walter K. Njoroge – Team Leader
  - ✓ Dr. Abdallah S. Merenga
  - ✓ Dr. Charles M. Migwi
  - ✓ Dr. Daniel B. Bem
  - ✓ Dr. Nicholas M. Muendo
  - ✓ Dr. Phillip Musyimi
- Prof. John Okumu -
  - Dr. Mathew K. Munji
  - Dr. Raphael L. Nyenge
  - Dr. Lawrence O. Ochoo
  - Dr. Stanley W. Kahuthu

### Collaborators

- ✓ Prof. Eevan Dyk –Nelson Mandela University' South Africa
- ✓ Prof. Martin Ntwaeaborwa-University of the Witwatersrand, South Africa
- ✓ Prof. Mokhotjwa Dhlamini- University of South Africa UNISA; South Africa
- ✓ Dr. Daniel Wamwangi-University of the Witwatersrand, South Africa

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## Material Science Research



### Research areas:

#### A). Nano Technology /Thin film technology

Synthesis of nanoparticles/ deposition of thin films  
for various applications

Solar cells  
Memory  
LEDs

Water treatment  
Gas sensing  
Energy efficient  
windows

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## Material Science Research Cont;

Fabrication and Characterization of solar cells/ modules

Theoretical Modeling of various semi-conductor properties

### B) Polymer physics research

- Research on biodegradable polymers
- Characterization of mechanical, optical and electrical properties



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## Research Facilities

Main facilities for research:

### Thin Film Deposition techniques

- ✓ Sputtering / evaporation
- ✓ Spray pyrolysis
- ✓ Spin coating
- ✓ Chemical bath deposition
- ✓ Electroplating
- ✓ Chemical vapor deposition (CVD)

### Characterization techniques

- ✓ Optical spectroscopy
- ✓ Electrical characterization
- ✓ Dynamical mechanical analyzer



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- Computer modeling
- ✓ Computer cluster
  - ✓ Quantum espresso
  - ✓ Lab view
  - ✓ MATLAB

## Research Facilities cont;

### Facilities available from collaborations

- ✓ X-ray Diffraction (XRD)
- ✓ Scanning Electron Microscopy (SEM) / EDS
- ✓ Atomic Force Microscopy (AFM)
- ✓ Transmission Electron Microscopy (TEM)
- ✓ Rutherford Backscattering Spectroscopy (RBS)
- ✓ Photo-luminescence spectro-photometer
- ✓ Hall Effect
- ✓ Raman Spectroscopy
- ✓ X-ray Photo Spectrometer (XPS)



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## Thin film Coating Unit



- Sputtering technique both DC and RF for metals, oxides and oxynitrides films
- Evaporation including reactive evaporation



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### Post deposition treatment ; Annealing facilities in air or inert ambient



Electrical characterization employing isothermal or non-isothermal annealing

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### Dynamical Mechanical Analyser



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## Spectrophotometer for transmittance and reflectivity measurement



Optical constants deduced from the measured data through simulations

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## Current Research Topics



### Ph.D. Students Ongoing

Seral No.	Name of the student	Research Topic
1.	Agoundedemba Maklewa	Improving the performance of FTO/In <sub>2</sub> S <sub>3</sub> /CuInS <sub>2</sub> /Graphite solar photovoltaic cells by introducing the ZnO thin layer.
2	Afia Owusuah Akyaw	Analysis of Thermal and Chemical Stability of CsPbI <sub>3</sub> Perovskite Photovoltaic Material Synthesized under Different Conditions
3	Edward Bwayo	Characterization of Electro-Optical properties of Al <sub>2</sub> O <sub>3</sub> /ZnS nanostructures for solar cell efficiency

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# *Thank you*

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