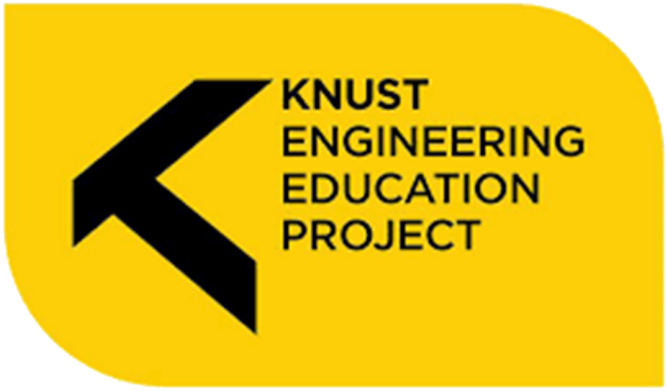
KNUST ENGINEERING EDUCATION PROJECT

KNUST
Kwame Nkrumah University of Science and Technology, Kumasi

KEEP STUDENTS

HAND BOOK

ACE Impact
Africa Centers of Excellence for Development Impact



ACE Impact

Africa Centers of Excellence for Development Impact

CONTENTS

ABOUT US

The College of Engineering (CoE), Kwame Nkrumah University of Science and Technology (KNUST) runs 18 different engineering programmes at the undergraduate level and 30 postgraduate programmes. The vision of CoE is to become Africa's leading Engineering College by 2025 (Corporate Strategic Plan 2016 – 2025). A key approach to achieving this vision is by expanding postgraduate education and research through innovative programmes that would attract local and international students.

The KNUST Engineering Education Project (KEEP) under the African Centre of Excellence (ACE) for Development Impact is focused on an institution-wide strengthening of the engineering and and technology programmes. The objective of the ACE is to improve quality of postgraduate education and research and increase enrolment. In line with this objective, KEEP aims to deliver high quality postgraduate programmes, conduct and disseminate cutting-edge research focused on addressing development challenges in Africa.

There are four major project themes which are;

- **Digital Development Technologies Research**
- **Distributed Computing and E-Forensics Research**
- **Power Systems Research**
- **Renewable Energy Research**

OUR VISION

To contribute to Ghana and the sub-region's industrial and digital revolution through excellence in engineering education, research and innovation to serve industry and society.

OUR MISSION

- To generate new knowledge to address problems faced by Ghana and the sub-region by offering state-of-the-art postgraduate and doctoral programmes.
- To undertake collaborative projects which offer opportunities for long-term interaction with academia and industry.
- To collaborate with other academic and research institutes around the world to strengthen the education and research ecosystem

KNUST
ENGINEERING
EDUCATION
PROJECT

ACE Impact

Africa Centers of Excellence for Development Impact

POST-GRADUATE ADMISSIONS

The Best Choice For Your Education

RESEARCH THEMES

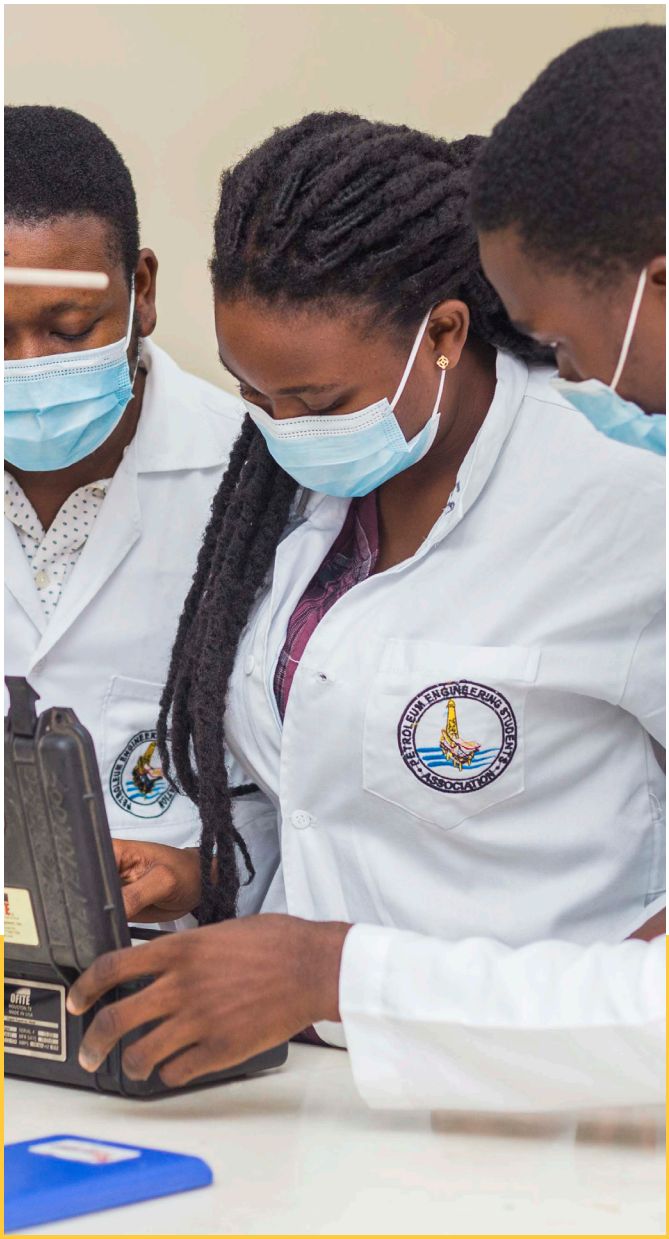
RESEARCH THEMES I
Renewable Energy Research

RESEARCH THEMES II
Power Systems Research

RESEARCH THEMES III
Digital Development Technologies Research

RESEARCH THEMES IV
Distributed Computing and E-Forensics Research

MPhil
BIOENGINEERING



The MPhil programmes in Bioengineering facilitate the close integration of biological, physical, and computational sciences and engineering in the study of biological processes. The programme adopts a systematic and quantitative approach to the study of biological systems

AIMS AND OBJECTIVES

• The aim is to provide students with the necessary knowledge to contribute to the biological industry as well as to optimize existing bioprocesses, and to develop new technologies. A candidate for a MPhil degree is expected to demonstrate knowledge in the discipline and to synthesize and create new knowledge, making a contribution to the field.

• The objective of the programme is to provide training in engineering for biologically related activities to meet the demands of agriculture, industry, and rural development.

ENTRY REQUIREMENT

Candidates with First Class or Second Class Upper degree in Engineering or related programmes from a recognised university may gain admission into the MPhil programme.

General Requirements

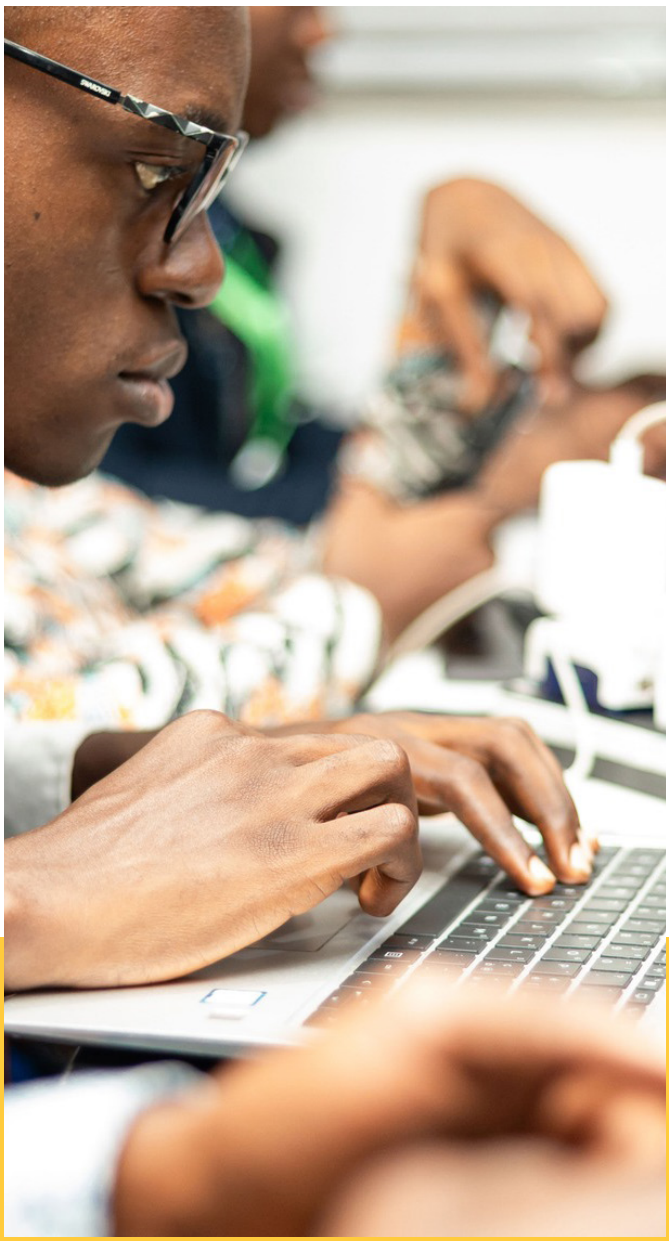
For the MPhil Programme, candidates with:

- BSc Agricultural Engineering and with a minimum of Second Class Lower Division and relevant working experience.
- BTech. Agricultural Engineering and with a minimum of Second Class Lower Division and relevant working experience.
- BSc in any allied discipline with a minimum of Second Class Lower Division and relevant working experience.
- In addition candidates must pass a selection interview.

SUMMARY OF COURSES

YEAR	COURSE CODE	COURSE NAME
Year 1 Semester 1	AE 541	Research Methods and Instrumentation
	AE 543	Renewable Energy Applications for Rural Development
	AE 573	Wastewater Reuse for Agriculture
	AE 597	Bioethanol and Biodiesel Technology
	AE 575	Bioprocess Engineering
Year 1 Semester 2	AE 560	Advanced Computer Applications
	AE 578	Entrepreneurship Development and Management of Bioenergy Systems
	AE 568	Economic Planning of Renewable Energy Systems
	AE 574	Waste Treatment and Disposal in Developing Countries
	AE 566	Biogas Technology
	AE 572	Thermo-Chemical Conversion of Biomass
Year 2 Semester 1	AE 698	Research Projec
Year 2 Semester 2	AE 698	Research Projec

MPhil
COMPUTER ENGINEERING



AIMS AND OBJECTIVES

The main aim of the MPhil Computer Engineering programme is to develop highly skilled research professionals who have an innovative disposition, the confidence and abilities to assume leadership roles in technology, business and the community.

ENTRY REQUIREMENT

First Class or Second Class (Upper Division) Hons. B.Sc. degree or its equivalent in Computer Engineering, Electrical & Electronic Engineering,Telecommunications Engineering or any field of specialization relevant to the programme from a recognised University.

- Candidates who do not meet the requirements in (i) above may be accepted subject to passing an interview. Such candidates may be required to take some recommended courses to make up for deficiencies in which may be identified as a result of their background.
- Candidates from non-Anglophone countries must have an internationally recognised Certificate of Proficiency in the English Language (TOEFL or British Council, IELTS) with above average score or be available to attend a three (3) months English language course at KNUST.

SUMMARY OF COURSES

YEAR & ELECTIVE	COURSE CODE	COURSE NAME
Year 1 **Semester 1** → **Elective Course** Elective Courses to be taken by student	COE 575	Broadband Communication Networks
	COE 597	Research Methods and Ethics
	COE 585	Advanced Computer Architecture
	COE 557	Artificial Intelligence
	COE 581	Advanced VLSI System Design
	COE 561	Optical Communication Systems
	COE 581	Embedded Real-time Operating Systems
	COE 583	Internet of Things Technology
Year 1 **Semester 2** → **Elective Course** Elective Courses to be taken by student (Select at least one)	COE 562	Engineering Systems Design and Modelling
	COE 572	Advanced Digital Signal Processing
	COE 592	Advanced Signal and Communication Theory
	COE 588	Neural Networks and Deep Learning
	COE 576	Networks and Web Security
	COE 588	Intelligent Systems and Robotics
	COE 584	Advanced Software Engineering
	COE 568	Advanced Distributed Systems
Year 2		MPhil Thesis

MPhil
CHEMICAL ENGINEERING

The Department of Chemistry was running a BSc programme in Chemical Technology. When the need arose, a new department was created in 1976 in the name of Department of Chemical Engineering at KNUST. Since then the Department has been training hundreds of BSc Chemical Engineers who work in all sectors of the Ghanaian economy from major industries, small scale industries, banks etc.

AIMS AND OBJECTIVES

The primary objectives of our programmes is to prepare highly qualified chemical engineers capable of finding solutions to technological problems in the chemical and allied processing industries in order to satisfy the needs and desires of society. However, mindful of the peculiarities of our environment and times, characterised by dwindling avenues for wage employment in the formal sector, diminishing natural resources and fast degradation of the environment, an essential focus of the training programme has been to equip the graduates with the necessary skills to enable them to enter into self-employment by judiciously harnessing and processing our natural resources. The prgramme also seeks to give the graduates as broad technical and general background as possible. Furthermore, the programme also serves as training point for future lecturers of the department and the polytechnics.

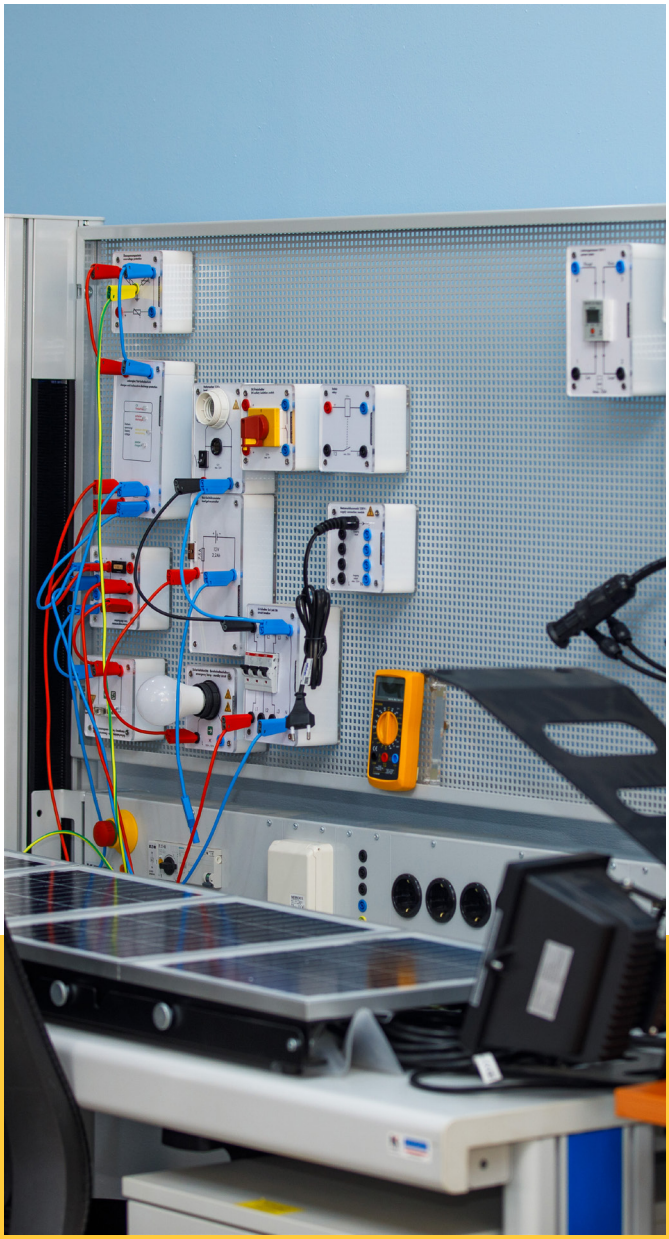
ENTRY REQUIREMENT

- Applicants must possess a BSc Degree (First Class or Second Class (Upper Division) in either Chemical Engineering or other engineering/science disciplines. Candidates with BSc Second Class (Lower Division) in Chemical Engineering and at least three years relevant experience will also be considered.
- All applicants are screened through an interview process. A synopsis of the research proposal

SUMMARY OF COURSES

YEAR	C O U R S E CODE	COURSE NAME
Year 1 **Semester 1**	CHE 551	Advanced Transport Phenomena I
	CHE 553	Advanced Chemical Thermodynamics
	CHE 555	Advanced Process Control
	CHE 557	Fuels and Energy Technology
	CHE 559	Mathematical Methods in Chemical Eng.
	CHE 561	Seminar I
Year 1 **Semester 2**	CHE 552	Advanced Transport Phenomena II
	CHE 554	Chemical Reaction Engineering
	CHE 556	Separation Processes
	CHE 558	Environmental Engineering
	CHE 560	Process Optimization
	CHE 562	Seminar II
Year 2 **Semester 1**	CHE 671	Master Thesis in Chemical Eng. I
	XXX xxx	Elective I
→ **Elective Course** Elective Courses to be taken by student (Select at least one)	CHE 661	Biochemical Engineering
	CHE 663	Food Process Engineering
	CHE 665	Advanced Structural Ceramics
	CHE 667	Polymer Processing
Year 2 **Semester 2**	CHE 672	Master Thesis in Chemical Eng. II
	XXX xxx	Elective II
→ **Elective Course** Elective Courses to be taken by student (Select at least one)	CHE 660	Plastic and Composites
	CHE 662	Synthesis of Polymers
	CHE 664	Production and Properties of Explosives
	CHE 666	Pulp Properties Bleaching Processes
	CHE 668	Pulp Processing & Papermaking Operations
	CHE 670	Engineering Statistics

MPhil
POWER SYSTEMS ENGINEERING



The programme aims to give students the skills and specialist knowledge required to significantly enhance their career prospects in the field of electrical engineering.

AIMS AND OBJECTIVES

In pursuit of the above aim, the following objectives will be pursued to:

- provide students with knowledge and skills to plan, design and operate modern electric power systems.
- provide graduates with the skill to carry out research in electric power systems.
- develop new techniques and tools for improved power system operation.

ENTRY REQUIREMENT

Applicants with a BSc/BEng degree in Electrical & Electronic Engineering discipline from a recognised University with a minimum average grade of 2nd class lower division. Applicants with degrees from closely related disciplines such as BSc/BEng in Electronics or Physics could also be considered.

SUMMARY OF COURSES

YEAR & ELECTIVE	COURSE CODE	COURSE NAME
Year 1 **Semester 1**	EE 551	Power System Components
	EE 553	Energy Systems and Analysis
	EE 555	Computational Concepts and Tools
	EE 557	Project Management and Investment Appraisal
	EE 559	Protection of Power Systems
Year 1 **Semester 2**	EE 550	Electrical Installations
	EE 552	Smart Grids and Energy Management Systems
	EE 554	Power Electronics and Machines
	EE 5XX	Option I
	EE 5XX	Option II
Elective Course Elective Courses to be taken by student (Select two)	EE 556 EE 558 EE 560	Control Concepts and Methods New and Renewable Energy Systems Power Markets and Economics
Year 2 **Semester 1**	EE 691	Engineering Research Methods
	EE 693	Seminar I
	EE 697	Thesis I
Year 2 **Semester 2**	**EE 694**	Seminar II
	EE 698	Thesis II

MPhil
TELECOMMUNICATION ENGINEERING

The programme aims to give students the skills and specialist knowledge required to significantly enhance their career prospects in the field of Telecommunication Engineering.

AIMS AND OBJECTIVES

The objectives of the programme are to;
Provide students with knowledge and skills to plan, design and operate modern Telecommunication-Systems
Provide graduates with the skill to carry out research in Telecommunication Engineering related topics
Develop new technologies for improved Telecommunication Systems Operation.

ENTRY REQUIREMENT

Applicants with a BSc/BEng degree in Electrical & Electronic Engineering, Telecommunication Engineering and Computer Engineering disciplines from a recognised University with a minimum average grade of 2nd class lower division. Applicants with degrees from closely related disciplines such as BSc/BEng in Electronics or Physics could also be considered.

SUMMARY OF COURSES

YEAR & ELECTIVE	COURSE CODE	COURSE NAME
Year 1 **Semester 1**	TE 551	Stochastic Processes and Random Variables
	TE 553	Project Management
	TE 555	Responsible Artificial Intelligence and Emerging Techniques
	TE 557	Optimization Methods and Applications
→ **Year 2** **Semester 2** **Elective Course** Elective Courses to be taken by student (Select 4)	TE 562	Advanced Antenna Theory and Design
	TE 564	Advanced Microwave and Millimeter Wave Engineering
	TE 566	Radio Frequency System Design
	TE 568	Computational Techniques in Electromagnetics
	TE 5610	Emerging Trends in Radio Frequency Engineering
	TE 592	Advanced Electromagnetic Field Theory
	TE 582	Special Topics in Cybersecurity, Cryptography and Network Security
	TE 584	Data Warehousing and Mining
	TE 586	Cloud, Edge/Fog Computing Security
	TE 588	Computational Intelligence Methods and Applications
	TE 5810	Special Topics in Networking: Blockchain/IoT Networks and Protocols
	TE 594	Quantum Computation and Information Processing
	TE 572	Optical Communications Systems and Protocols
	TE 574	Emerging Trends in Wireless Communications: NextGen Networks
	TE 576	Advanced Signal Processing with Machine Learning
	TE 578	Software Defined Networking and Network Function Virtualization
	TE 596	Information Theory and Channel Coding for Mobile Radio Networks
	TE 598	Advanced Broadcast Techniques

MPhil
MATERIAL ENGINEERING

The aim of the programme is to provide training in materials processing, manufacturing and development, and apply the principles of basic sciences and engineering to understanding the behaviour of materials, their development and applications.

AIMS AND OBJECTIVES

The objectives of the programme are to:

- Provide engineering leadership in industrial, governmental, and academic settings, while serving both their profession and the public
- Bring about innovation in a wide variety of technical fields including, but not limited to materials, energy, electronics, medicine, communications, transportation and recreation
- Empower students to excel in careers related to the entire life cycle of materials – from synthesis and processing, through design and development, to manufacturing, performance, and recycling.

ENTRY REQUIREMENT

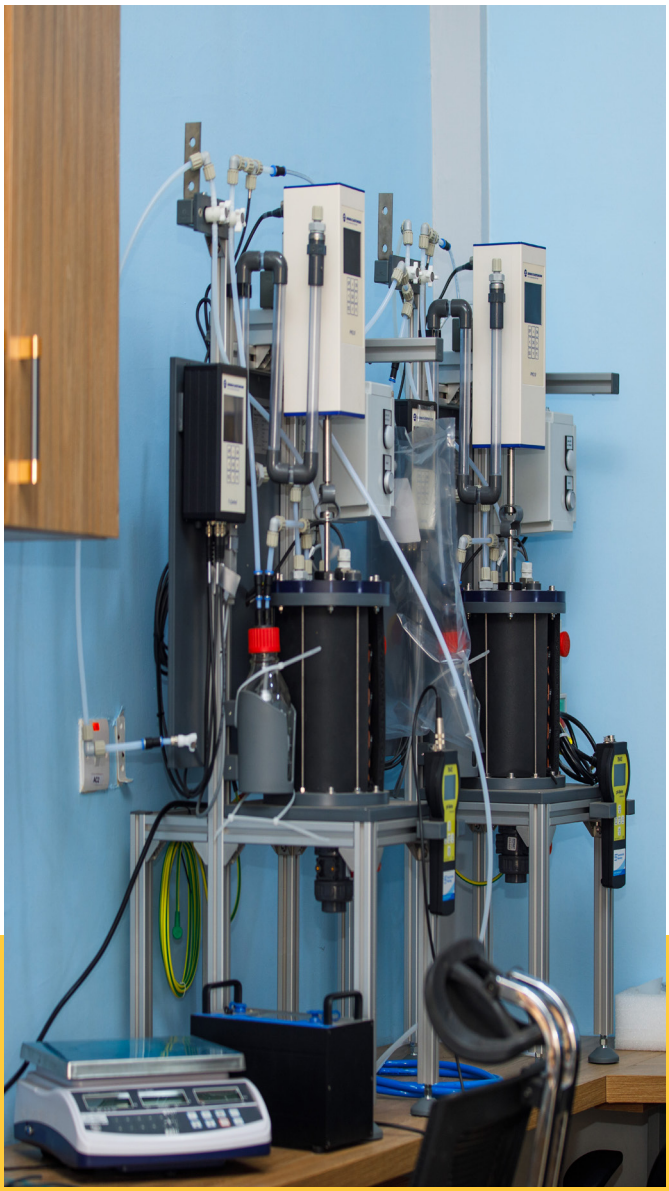
The following shall be the admission requirements for prospective students:

- Either (i) a First Class or Second Class (Upper Division) B.Sc. degree or its equivalent in Engineering and Sciences, or any field of specialization relevant to the programme from a recognized University or (ii) a Second Class (Lower Division) B.Sc. degree or its equivalent in Engineering and Sciences or any field of specialization relevant to the programme from a recognized University with at least three (3) years of relevant experience.
- Applicants with degrees in other engineering/science disciplines (e.g. Chemistry, Physics, Mathematics, Electrical Engineering, etc.) may be required to take prerequisite courses to make up for deficiencies in undergraduate materials engineering.
- For non-English speaking applicants, arrangements may be made with the Department of Languages

SUMMARY OF COURSES

YEAR & ELECTIVE	COURSE CODE	COURSE NAME
Year 1 **Semester 1**	MSE 551	Thermodynamics of Materials
	MSE 553	Defects, Diffusion and Transformation of Materials
	MSE 555	Solid State Theories of Materials
	MSE 557	Research Methods
→ **Elective Course** Elective Courses to be taken by student (At least one)	MSE 559	Polymeric Materials
	MSE 561	Ceramic Materials
	MSE 563	Metallic Materials
	MSE 565	Materials Synthesis
	MSE 567	Nanomaterials and Nanotechnology
Year 1 **Semester 2**	MSE 552	Interfacial Thermodynamics and Kinetics
	MSE 554	Advanced Materials Characterization
	MSE 556	Materials in Sustainable Development
	MSE 558	Mathematical, Statistical, and Computational
→ **Elective Course** Elective Courses to be taken by student (Atleast one)	MSE 560	Materials for Energy Development
	MSE 562	Composite Materials
	MSE 564	Functional Materials
	MSE 566	Biomaterials
Year 2 **Semester 1**	MSE 651	Thesis I
	MSE 653	Seminar I
Year 2 **Semester 2**	MSE 652	Thesis II
	MSE 654	Seminar II

MPhil
RENEWABLE ENERGY TECHNOLOGIES



The failure of the conventional energy-based sector, in particular, for electricity generation, to live up to expectation, and the fluctuating price of crude oil have become major threats to sustainable development. Hence, the recent interest in renewable energy (RE). Sub-Saharan Africa SSA receives an estimated average direct solar radiation of about 6 million Gigawatts (the highest for any region in the world) and has abundant bioenergy resources, in addition to other renewable resources like hydropower, wind energy and geothermal energy

AIMS AND OBJECTIVES

The objectives of the programme are to:

- Add up to the Limited number of skilled engineers in renewable energy technologies including solar photovoltaic (PV), wind and biofuels
- Increase in the knowledge of RE Technology on the part of key actors in the public and private sectors, including energy policy makers and small/ medium scale entrepreneurs.

ENTRY REQUIREMENT

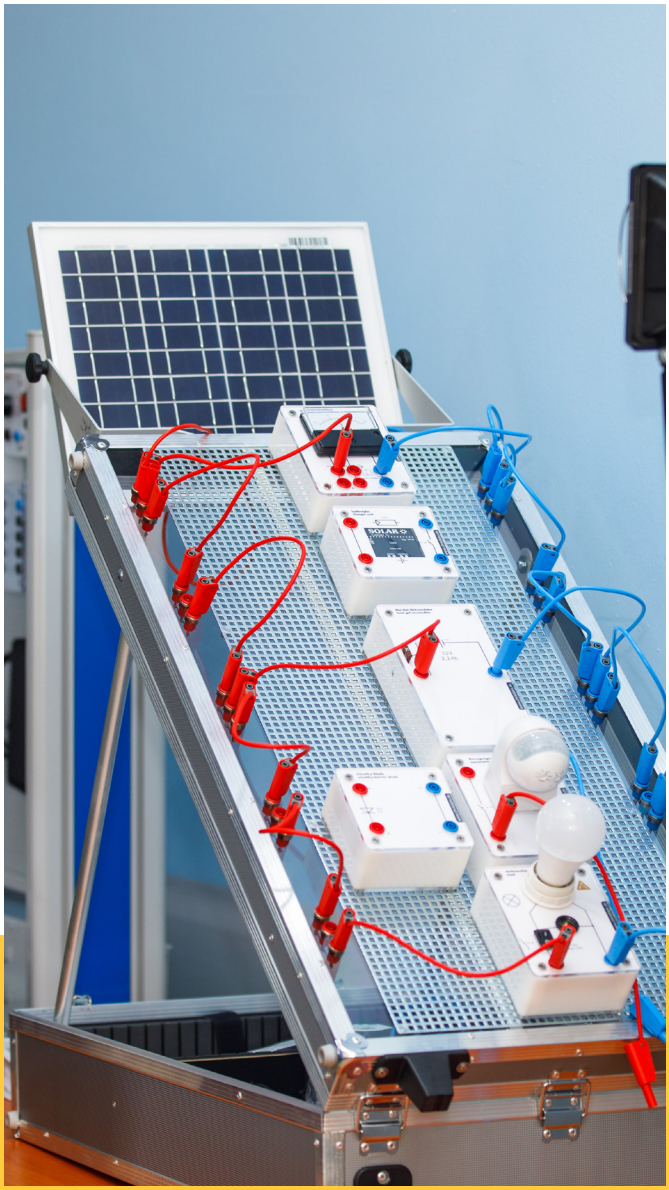
Applicants with a minimum of second class lower degree or its equivalent from a recognised university in the following areas:

- BSc Engineering
- BSc Physics, BSc Chemistry, BSc Mathematics, BSc Environmental Science
- Candidates must have a minimum of two years working experience in the renewable energy industry
- In addition, candidates with second class lower degrees must pass an interview

SUMMARY OF COURSES

YEAR & ELECTIVE	COURSE CODE	COURSE NAME
Year 1 **Semester 1**	RET 551	Introduction to RE Technologies
	RET 553	Entrepreneurship and Small Business Management
	RET 555	Energy Policy, Gender and Planning
	RET 557	Energy and Environment
→ **Elective Course** Elective Courses to be taken by student (Select two)	RET 561	Liquid Biofuel Production Systems
	RET 563	Biogas Technology
	RET 565	Solar Thermal Technology
	RET 567	Small Hydropower Technology Nanomaterials and Nanotechnology
Year 1 **Semester 2**	RET 552	Research Methods
	RET 554	Project Analysis and Management
	RET 556	Renewable Energy Laboratory
→ **Elective Course** Elective Courses to be taken by student (At least one)	RET 562	Solar PV Technology
	RET 564	Wind Power Technology
	RET 566	Bio-energy Technology
	RET 568	Hybrid Energy Systems
Year 2 **Semester 1**	RET 651	Research Project I
Year 2 **Semester 2**	RET 652	Research Project II

MSc
RENEWABLE ENERGY TECHNOLOGIES



Energy is now widely recognised as a critical input for achieving sustainable development. Vital sectors of Sub-Sahara African (SSA) economies such as agriculture, education and health have failed to meet expectations partly because of poor access to modern energy services which have made it extremely difficult to develop many facilities like water resources for small-scale irrigation and potable water to ensure food security, infrastructure for lighting and communication. The poor living conditions in rural areas and the lack of employment opportunities have all contributed to social unrest, which is of national and international concern.

AIMS AND OBJECTIVES

The objectives of the programme are to:

- Add up to the Limited number of skilled engineers in renewable energy technologies including solar photovoltaic (PV), wind and biofuels
- Increase in the knowledge of RE Technology on the part of key actors in the public and private sectors, including energy policy makers and small/ medium scale entrepreneurs.

ENTRY REQUIREMENT

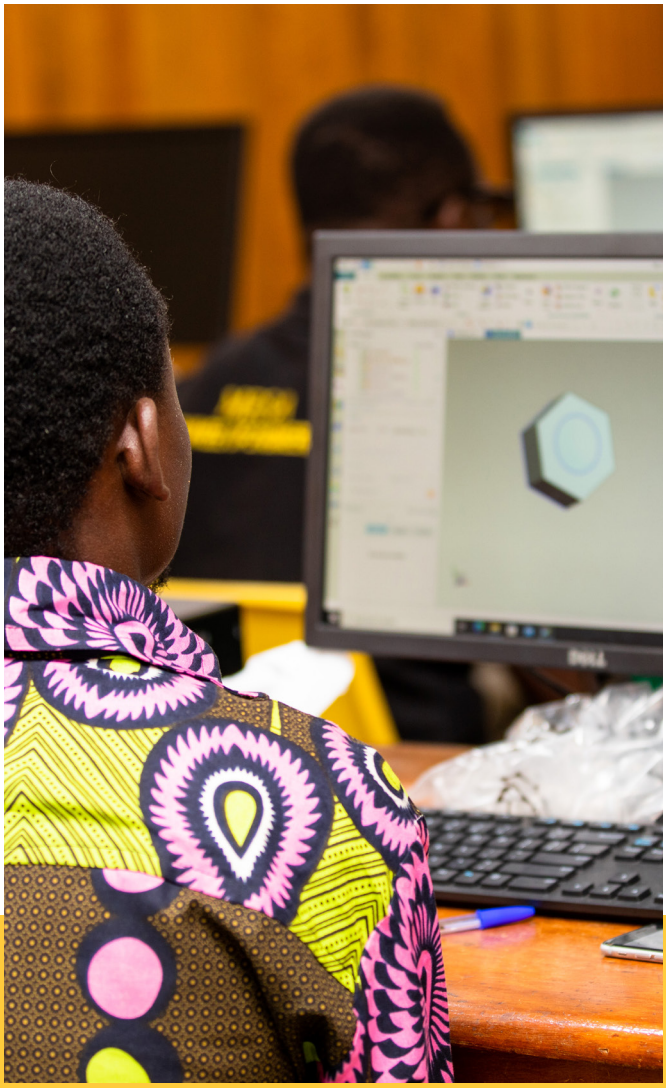
Applicants with a minimum of second class lower degree or its equivalent from a recognised university in the following areas:

- BSc Engineering
- BSc Physics, BSc Chemistry, BSc Mathematics, BSc Environmental Science
- Candidates must have a minimum of two years working experience in the renewable energy industry
- In addition, candidates with second class lower degrees must pass an interview

SUMMARY OF COURSES

YEAR & ELECTIVE	COURSE CODE	COURSE NAME
Year 1 **Semester 1**	RET 551	Introduction to RE Technologies
	RET 553	Entrepreneurship and Business Management
	RET 555	Energy Policy, Gender and Planning
	RET 557	Energy and Environment
→ **Elective Course** Elective Courses to be taken by student (Select two)	RET 561 RET 563 RET 565 RET 567	Liquid Biofuel Production Systems Biogas Technology Solar Thermal Technology Small Hydropower Technology
Year 1 **Semester 2**	RET 552	Research Methods
	RET 554	Project Analysis and Management
	RET 556	Renewable Energy Laboratory
	RET 558	Research Project
→ **Elective Course** Elective Courses to be taken by student (Atleast one)	RET 562 RET 564 RET 566 RET 568	Solar PV Technology Wind Power Technology Bio-energy Technology Hybrid Energy Systems

MPhil
SCIENTIFIC COMPUTING & INDUSTRIAL MODELLING



AIMS AND OBJECTIVES

The ultimate aim of the programme is to equip students with a strong foundation in Scientific and Technical Computing as well as industrial modeling, capable of utilizing cutting edge Mathematical concepts and state-of-the-art computing resources to deliver cost-effective technology solutions for the public institutions, local market and the private sector.

ENTRY REQUIREMENT

Applicants with a minimum of second class lower division from a recognized university in the following areas:

I. Bachelor of Science in Mathematics
II. Bachelor of Science in Mathematical Statistics
III. Bachelor of Science in Computer Science
IV. Bachelor of Science in Engineering

Applicants applying for PhD must have a Masters or MPhil in Mathematics, Computer Science or equivalent

SUMMARY OF COURSES

YEAR & ELECTIVE	COURSE CODE	COURSE NAME
Year 1 Semester 1	SCIM 551	Mathematical Foundation
	SCIM 553	Advanced Linear Algebra
	SCIM 555	Mathematical Analysis
	SCIM 557	Measure Theory and Integration
	SCIM 559	Numerical linear Algebra
	SCIM 561	Scientific and Technical Computing
	SCIM 563	Data mining and visualization
Year 1 Semester 2	SCIM 552	Methods of Applied Mathematics
	SCIM 554	Dynamical systems and bifurcation theory
	SCIM 556	Partial Differential equations
	SCIM 558	Advanced Scientific and Technical Computing
	SCIM 562	Numerical Solutions for Differential Equations
	SCIM 564	Finite elements methods
	SCIM 566	High performance computing
Year 2 Semester 1	SCIM 565	Case studies

SUMMARY OF COURSES

YEAR & ELECTIVE	COURSE CODE	COURSE NAME
→ **Elective Course** Elective Courses to be taken by student (Select two)	SCIM 667	Reservoir simulation*
	SCIM 669	Imaging and Computer Vision*
	SCIM 671	Data visualization*
	SCIM 673	Biomathematical Modeling*
	SCIM 675	Biogeochemical Modeling*
	SCIM 677	Distributed & Grid Computing*
	SCIM 679	Monte Carlo simulation*
	SCIM 681	Computational Fluid Dynamics*
	SCIM 683	Computational Finance*
	SCIM 685	Nonlinear Optimization
Year 2 **Semester 2**	SCIM 598	Thesis work and report writing
	SCIM 600	Seminar

MSc
CYBER SECURITY & DIGITAL FORENSIC

The programme provides students with Cyber Security and Digital Forensics managerial policy development and problem-solving skills that blend theory with best industry practices and practical application

AIMS AND OBJECTIVES

The objectives of the programme are:
• To expose students to the various international, regional and national conventions and laws on cyber security and digital forensics.
KEEP SCHOLAR HANDBOOK 39
• To equip students with the science, methods and techniques to conduct Cyber Security intelligence and Digital Forensic operations in identifying cyber crime patterns and trends.
• To equip students with knowledge and theories in cyber security terrorism and scientific digital forensic investigation.
• To equip students with research skills to successfully undertake an advanced report presentation and evidence-based cases in the area of Cyber Security and Digital Forensics and trends.
• To expose students to current scenario in the field of Cyber Security relating to major segments like Banking, Mobile communication, Media applications and Cyber Criminology.

ENTRY REQUIREMENT

• A good first degree (at least Second Class (Upper Division) in areas relevant to Forensic Science including Physics, Chemistry, Biochemistry, Biology, Molecular Biology, Pharmacy and Human Biology
• Two letters of recommendation from individuals who can attest to the candidate's character, scientific ability or work experience
• Pass interview selection process, aimed at ascertaining the candidate's background, qualifications, experience and interest.
• At least two years work experience in area relevant to forensics (e.g.) police, military, immigration, prisons, NACOB etc.

SUMMARY OF COURSES

YEAR & ELECTIVE	COURSE CODE	COURSE NAME
Year 1 **Semester 1**	CSDF 551	Secure Infrastructure Design
	CSDF 553	Research Methods and Professional Practice
	CSDF 555	Application Security
	CSDF 557	Computer Forensics
	CSDF 559	Cyber Law
→ **Elective Course** Elective Courses to be taken by student (Atleast one)	CSDF 561	Python Security Programming*
	CSDF 563	Digital Forensics Software Tools^
	* Cyber Security Program Elective ^Digital Forensics Program Elective	
Year 2 **Semester 2**	CSDF 552	Cryptography
	CSDF 554	Cloud Systems Architecture
	CSDF 556	Information Security
	CSDF 558	Operating System Security and Forensics
	CSDF 560	Advanced Computer Forensics
→ **Elective Course** Elective Courses to be taken by student (Atleast one)	CSDF 562	Intelligence and Forensic Analysis^
	CSDF 564	Database Security Management*
	* Cyber Security Program Elective ^ Digital Forensics Program Elective	
	CSDF 570	THESIS

PhD BIOENGINEERING

The PhD programmes in Bioengineering facilitate the close integration of biological, physical, and computational sciences and engineering in the study of biological processes. The programme adopts a systematic and quantitative approach to the study of biological systems.

AIMS AND OBJECTIVES

- The aim is to provide students with the necessary knowledge to contribute to the biological industry as well as to optimize existing bioprocesses, and to develop new technologies. A candidate for a PhD degree is expected to demonstrate knowledge in the discipline and to synthesize and create new knowledge, making a contribution to the field.
- The objective of the programme is to provide training in engineering for biological related activities to meet the demands of agriculture, industry, and rural development.

ENTRY REQUIREMENT

Candidates with MPhil/MSc in Engineering or related programmes from a recognised university may gain admission into the PhD programme

SUMMARY OF COURSES

YEAR & ELECTIVE	COURSE CODE	COURSE NAME
Year 1 **Semester 1**	AE 541	Research Methods and Instrumentation
	AE 543	Renewable Energy Applications for Rural Development
	AE 573	Wastewater Reuse for Agriculture
	AE 597	Bioethanol and Biodiesel Technology
	AE 575	Bioprocess Engineering
Year 1 **Semester 2**	AE 560	Advanced Computer Applications
	AE 578	Entrepreneurship Development and Management of Bioenergy Systems
	AE 568	Economic Planning of Renewable Energy Systems
	AE 574	Waste Treatment and Disposal in Developing Countries
	AE 566	Biogas Technology
	AE 572	Thermo-Chemical Conversion of Biomass
Year 2 **Semester 1**	AE 698	Research Project
Year 2 **Semester 2**	AE 698	Research Project
Year 3 **Semester 1**	AE 698	Research Project
Year 3 **Semester 2**	AE 698	Research Project

PhD COMPUTER ENGINEERING

AIMS AND OBJECTIVES

The main aim of the PhD Computer Engineering programme is to develop highly skilled research professionals who have an innovative disposition, the confidence and abilities to assume leadership roles in technology, business and the community.

ENTRY REQUIREMENT

Either First Class or Second Class (Upper Division) Hons. B.Sc. degree or its equivalent in Computer Engineering, Electrical & Electronic Engineering, Telecommunications Engineering or any field of specialization relevant to the programme from a recognized University

• A good Master's degree (MPhil or MSc) in Computer Engineering, Electrical & Electronic Engineering, Telecommunications Engineering or any field of specialization relevant to the programme from a recognized University, with a CWA of at least 60

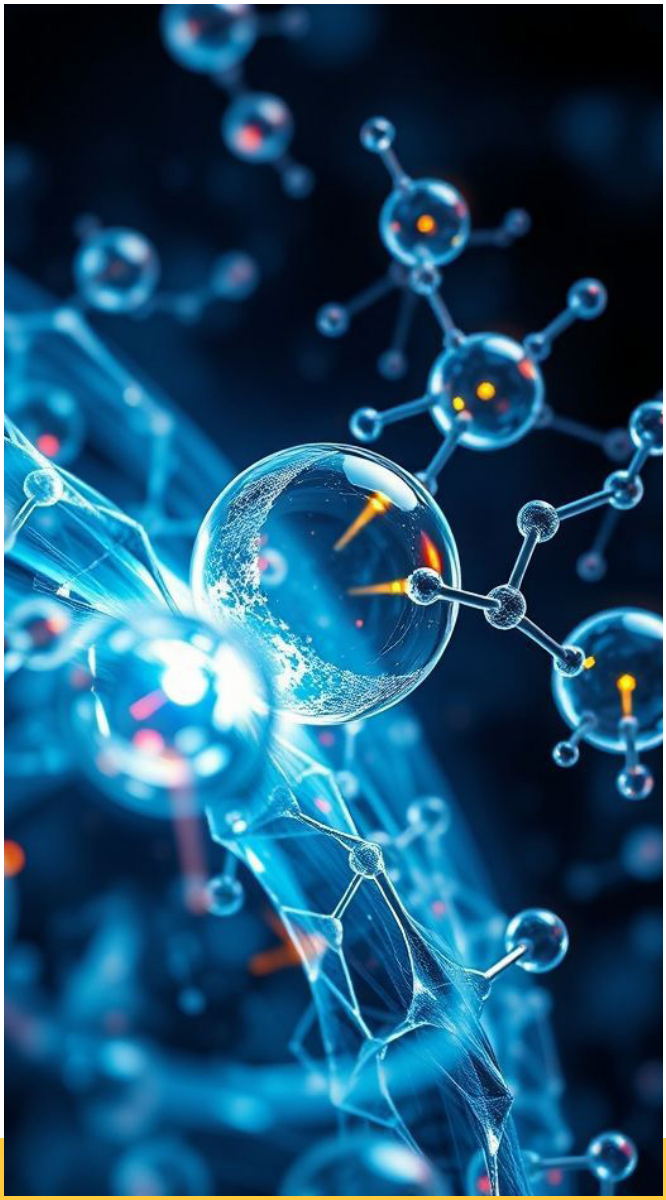
• Candidates who do not meet the requirements in (i) or (ii) above may be accepted subject to passing an interview. Such candidates may be required to take some recommended courses to make up for deficiencies which may be identified as a result of their background.

• Candidates from non-Anglophone countries must have an internationally recognised Certificate of Proficiency in the English Language (TOEFL or British Council, IELTS) with above average score or be available to attend a three (3) months English language course at KNUST.

SUMMARY OF COURSES

YEAR & ELECTIVE	COURSE CODE	COURSE NAME
Year 1 **Semester 1**	COE 575	Broadband Communication Networks
	COE 597	Research Methods and Ethics
	COE 585	Advanced Computer Architecture
	COE 557	Artificial Intelligence
→ **Elective Course** Elective Courses to be taken by student ()	COE 581 COE 561 COE 581 COE 583	Advanced VLSI System Design Optical Communication Systems Embedded Realtime Operating Systems Internet of Things Technology
Year 1 **Semester 2**	COE 562	Engineering Systems Design and Modelling
	COE 572	Advanced Digital Signal Processing
	COE 592	Advanced Signal and Communication Theory
→ **Elective Course** Elective Courses to be taken by student ()	COE 588	Neural Networks and Deep Learning
	COE 576	Networks and Web Security
	COE 588	Intelligent Systems and Robotics
	COE 584	Advanced Software Engineering
	COE 568	Advanced Distributed Systems
Year 1 - 4		PhD Thesis

PhD CHEMICAL ENGINEERING



The Department of Chemistry was running a BSc programme in Chemical Technology. When the need arose, a new department was created in 1976 in the name of Department of Chemical Engineering at KNUST. Since then the Department has been training hundreds of BSc Chemical Engineers who work in all sectors of the Ghanaian economy from major industries, small scale industries, banks etc

AIMS AND OBJECTIVES

The primary objective of our programmes is to prepare highly qualified chemical engineers capable of finding solutions to technological problems in the chemical and allied processing industries in order to satisfy the needs and desires of society. However, mindful of the peculiarities of our environment and times, characterised by dwindling avenues for wage employment in the formal sector, diminishing natural resources and fast degradation of the environment, an essential focus of the training proramme has been to equip the graduates with the necessary skills to enabled them to enter into self-employment by judiciously harnessing and processing our natural resources. The programme also seeks to give the graduates as broad technical and general background as possible. Furthermore, the programme also serves as training point for future lecturers of the department and the polytechnics.

ENTRY REQUIREMENT

• Applicants must possess an MPhil degree from a recognized University. The first degree of the applicant should be First Class or Second Class (Upper Division) or its equivalent in Chemical Engineering.

• All applicants are screened through an interview process.

• An outline of research proposal (synopsis) and the statement of purpose should accompany the application.

• All applicants are required to pass an oral interview and demonstrate the ability to fund or prove the source of funds for the research

SUMMARY OF COURSES

YEAR & ELECTIVE	COURSE CODE	COURSE NAME
Year 1 **Semester 1**	CHE 551	Advanced Transport Phenomena I
	CHE 553	Advanced Chemical Thermodynamics
	CHE 555	Advanced Process Control
	CHE 557	Fuels and Energy Thechnology
	CHE 559	Mathematics Methods in Chemical Eng.
	CHE 561	Seminar I
Year 1 **Semester 2**	CHE 552	Advanced Transport Phenomena II
	CHE 554	Chemical Reaction Enginering
	CHE 556	Separation Processes
	CHE 558	Environmental Engineering
	CHE 560	Process Optimization
	CHE 562	Seminar II
Year 2 **Semester 1**	CHE 671	Doctoral Thesis in Chemical Eng. I
	XXX xxx	Elective I
→ **Elective Course** Elective Courses to be taken by student (At least one)	CHE 661	Biochemical Engineering
	CHE 663	Food Process Engineering
	CHE 667	Polymer Processing
	CHE 669	Nitrocellulose Propellant
Year 2 **Semester 2**	CHE 672	Doctoral Thesis in Chemical Eng. II
	XXX xxx	Elective II
→ **Elective Course** Elective Courses to be taken by student (At least one)	CHE 660	Plastic and Composites
	CHE 662	Synthesis of Polymers
	CHE 664	Production and Properties of Explosives
	CHE 666	Pulp Properties Bleaching Processes
	CHE 668	Pulp Processing & Papermaking Operations
	CHE 670	Engineering Statistics

PhD ELECTRICAL ENGINEERING

AIMS AND OBJECTIVES

The objectives of the programme are to:
• Build human capacity in high level research in subject areas in electric power engineering
• Provided academic breadth in subject areas in electric power engineering along with deep knowledge in various topics.

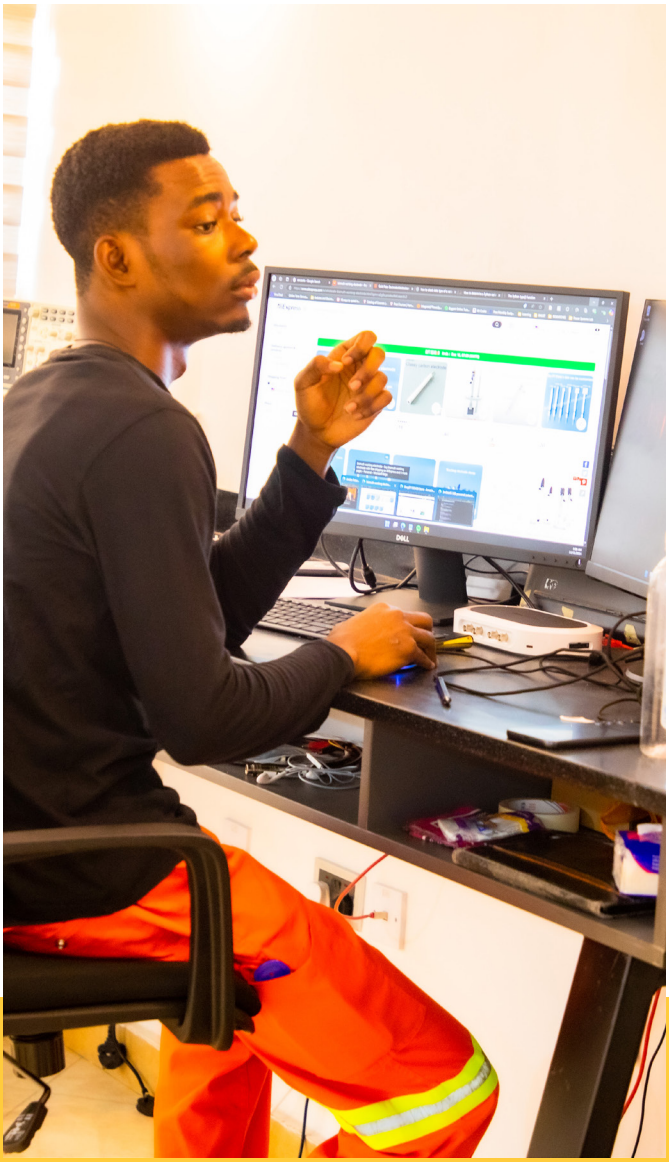
ENTRY REQUIREMENT

MSc/MEng/MPhil degree in Electrical & Electronic Engineering discipline from a recognised University. Applicants with degrees from closely related disciplines such as MSc/MEng/MPhil in Electronics or Physics could also be considered

SUMMARY OF COURSES

YEAR & ELECTIVE	COURSE CODE	COURSE NAME
Year 1 **Semester 1**	EE 771	Computational Concepts and Tools
	EE 773	Engineering research method
Year 1 **Semester 2**	EE 770	Smart Grids and Energy Management Systems
	EE 772	Research Seminar
	EE 7XX	Option
→ **Elective Course** Elective Courses to be taken by student (At least one)	EE 774	Control Concepts and Methods
	EE 776	New and Renewable Energy Systems
	EE 778	Power Markets and Economics
Year 1 - 4	EE 772	Research Seminar
	EE 873	Thesis

PhD TELECOMMUNICATION ENGINEERING



The programme aims to give students the skills and specialist knowledge required to significantly enhance their career prospects in research and in Academia relating to the field of Telecommunication Engineering.

AIMS AND OBJECTIVES

The objectives of the programme are to:

- Provide students with deep knowledge in theoretical framework of a broad spectrum of topics relating to Telecommunication Systems and Engineering
- Provide graduates with the skill to carry out far-reaching research in Telecommunication Engineering related topics
- Develop new technologies for improved Telecommunication Systems Operation.

ENTRY REQUIREMENT

MSc/MEng/MPhil degree in Electrical & Electronic Engineering, Telecommunication Engineering and Computer Engineering disciplines from a recognised University. Applicants with degrees from closely related disciplines such as MSc/Meng/MPhil in Electronics or Physics could also be considered.

SUMMARY OF COURSES

YEAR & ELECTIVE	COURSE CODE	COURSE NAME
Year 1 **Semester 1**	TE 507	Research Methods
	TE 555	Applied Mathematical Technique
→ **Elective Course** Elective Courses to be taken by student (At least two)	TE 557	Advanced Statistics
	TE 571	RF and Microwave Circuits
	TE 581	Digital Networks and Protocols
	TE 561	Digital Signal Processing
	TE 563	Information Theory and Coding
→ **Elective Course** Elective Courses to be taken by student ()	TE 562	Fiber Optic Transmission Systems
	TE 574	Wireless Communication Networks
	TE 576	Satellite and Broadcast Networks
	TE 584	Network Management and Planning
Year 2- 4 **Semester 1**	TE 693	Seminar I
	TE 697	Thesis I
Year 2- 4 **Semester 2**	TE 694	Seminar II
	TE 698	Thesis II

PhD
MATERIALS ENGINEERING

The aim of the programme is to provide training in materials processing, manufacturing and development, and apply the principles of basic sciences and engineering to understanding the behaviour of materials, their development and applications.

AIMS AND OBJECTIVES

The objectives of the programme are to:

- Provide engineering leadership in industrial, governmental, and academic settings, while serving both their profession and the public.
- Bring about innovation in a wide variety of technical fields including, but not limited to materials, energy, electronics, medicine, communications, transportation and recreation.
- Excel in careers related to the entire life cycle of materials – from synthesis and processing, through design and development, to manufacturing, performance, and recycling

ENTRY REQUIREMENT

The following shall be the admission requirements for prospective students:

- An MSc./MPhil degree or its equivalent in Materials Engineering, Civil Engineering, Mining Engineering, Petroleum Engineering, Metallurgical Engineering, Chemical Engineering or any field of specialization relevant to the programme from a recognized University.

- For non-English speaking applicants, arrangements may be made with the Department of Languages for the acquisition of the necessary English language skills prior to embarking on the programme.

SUMMARY OF COURSES

YEAR & ELECTIVE	COURSE CODE	COURSE NAME
Year 1 **Semester 1**	MSE 557	Research Methods
→ **Elective Course** Elective Courses to be taken by student (At least four)	MSE 551	Thermodynamics of Materials
	MSE 552	Interfacial Thermodynamics and Kinetics
	MSE 553	Defects, Diffusion and Transformation of Materials
	MSE 554	Advanced Materials Characterization
	MSE 555	Solid State Theories of Materials
	MSE 556	Materials in Sustainable Development
	MSE 558	Mathematical, Statistical, and Computational Techniques
	MSE 559	in Materials Science
	MSE 560	Polymeric Materials
	MSE 561	Materials for Energy Development
	MSE 562	Ceramic Materials
	MSE 563	Composite Materials
	MSE 564	Metallic Materials
	MSE 565	Functional Materials
	MSE 566	Materials Synthesis
	MSE 567	Biomaterials
	XXXX	Nanomaterials and Nanotechnology
Year 2 **Semester 1**	MSE 851	Thesis III
	MSE 853	Seminar II
Year 2 **Semester 2**	MSE 852	Thesis IV
	MSE 854	Seminar IV
Year 3 **Semester 1**	MSE 951	Thesis V
	MSE 953	Seminar V
Year 3 **Semester 2**	MSE 952	Thesis VI
	MSE 954	Seminar VI

PhD
SCIENTIFIC COMPUTING & INDUSTRIAL MODELLING

AIMS AND OBJECTIVES

The objectives of the programme are to:
• Provide training on how to use high performance computing as a simulation facility for the design, analysis, prototyping and development of new technologies and innovations.
• Provide an intellectually stimulating environment where students and faculties have the potential to develop their skills and enthusiasm to the best of their ability.
• Inculcate into students the capacity to solve problems using clear logical thinking.
• Provide a leading outline of interdisciplinary courses in industrial Modelling and Computing for varying class of students with varying background.
• Provide a Curriculum that is suitable both for students aiming to pursue research as well as those interested in other mathematically related professions.
• Provide an integrated system of teaching and learning tailored towards students needs and the development of the Ghana and the subregion
• Attract and select students of outstanding quality
• Produce the high calibre graduates sought by employers in academia, the private and the public sector.
• Support and maintain the member Universities of the National Institute for Mathematical Sciences as leading centres of excellence globally in teaching and research.

ENTRY REQUIREMENT

Applicants applying for PhD must have a Masters or MPhil in Mathematics, Computer Science or equivalent.

SUMMARY OF COURSES

YEAR & ELECTIVE	COURSE CODE	COURSE NAME
Year 1 Semester 1	SCIM 551	Mathematical Foundation
	SCIM 553	Advanced Linear Algebra
	SCIM 555	Mathematical Analysis
	SCIM 557	Measure Theory and Integration
	SCIM 559	Numerical linear Algebra
	SCIM 561	Scientific and Technical Computing
	SCIM 563	Data mining and visualization
Year 1 Semester 2	SCIM 552	Methods of Applied Mathematics
	SCIM 554	Dynamical systems and bifurcation theory
	SCIM 556	Partial Differential equations
	SCIM 558	Advanced Scientific and Technical Computing
	SCIM 562	Numerical Solutions for Differential Equations
	SCIM 564	Finite elements methods
	SCIM 566	High performance computing
Year 2 Semester 1	SCIM 565	Case studies
→ Elective Course Elective Courses to be taken by student (Select two)	SCIM 667	Reservoir simulation*
	SCIM 669	Imaging and Computer Vision*
	SCIM 671	Data visualization*
	SCIM 673	Biomathematical Modeling*
	SCIM 675	Biogeochemical Modeling*
	SCIM 677	Distributed & Grid Computing*
	SCIM 679	Monte Carlo simulation*
	SCIM 681	Computational Fluid Dynamics*
	SCIM 683	Computational Finance*
	SCIM 685	Nonlinear Optimization
Year 2 Semester 2	SCIM 598	Thesis work and report writing
	SCIM 600	Seminar

PhD
SUSTAINABLE ENERGY TECHNOLOGIES

The failure of the conventional energy-based sector, in particular, for electricity generation, to live up to expectation, and the fluctuating price of crude oil have become major threats to sustainable development. Hence, the recent interest in renewable energy (RE). Sub-Sahara African SSA receives an estimated average direct solar radiation of about 6 million Gigawatts (the highest for any region in the world) and has abundant bioenergy resources, in addition to other renewable resources like hydropower, wind energy and geothermal energy

AIMS AND OBJECTIVES

The objectives of the programme are to:

- Add up to the Limited number of skilled engineers in renewable energy technologies including solar photovoltaic (PV), wind and biofuels.
- Increase in the knowledge of RE Technology on the part of key actors in the public and private sectors, including energy policy makers and small/medium scale entrepreneurs.

ENTRY REQUIREMENT

- Applicants with good master's or MPhil degree in Engineering or related field from a recognised University
- In addition, candidates must pass an interview

SUMMARY OF COURSES

YEAR & ELECTIVE	COURSE CODE	COURSE NAME
Year 1 Semester 1	RET 551	Introduction to RE Technologies
	RET 553	Entrepreneurship and Small Business Management
	RET 555	Energy Policy, Gender and Planning
	RET 557	Energy and Environment
→ Elective Course Elective Courses to be taken by student ()	RET 571	Liquid Biofuel Production Systems
	RET 573	Biogas Technology
	RET 575	Solar Thermal Technology
	RET 577	Small Hydropower Technology
Year 1 Semester 2	RET 550	Research Methods
	RET 554	Project Analysis and Management
→ Elective Course Elective Courses to be taken by student ()	RET 572	Solar PV Technology
	RET 574	Wind Power Technology
	RET 576	Bio-energy Technology
	RET 578	Hybrid Energy Systems
Year 2 Semester 1	RET 697	Thesis I
	RET 691	Seminar I
Year 2 Semester 2	RET 698	Thesis II
	RET 692	Seminar II
Year 3 Semester 1	RET 897	Thesis III
	RET 891	Seminar III
Year 3 Semester 2	RET 898	Thesis IV
	RET 892	Seminar IV
Year 4 Semester 1	RET 997	Thesis V
	RET 991	Supervised Teaching I
Year 4 Semester 2	RET 998	Thesis VI
	RET 992	Supervised Teaching II

OUR POLICIES

SCHOLARSHIP POLICY

GOVERNANCE

The KEEP scholarship will be administered by a committee constituted by management of the College of Engineering. The Deputy Project Lead would lead the Awards Committee. Other members of the committee would include the Deans, Research Theme Leads and Heads of Departments of KEEP related courses. The role of the committee is to;

a. oversee the launch of all scholarships
b. establish selection criteria for assessment of applications
c. recommend shortlisted candidates to management for the award of all scholarships
d. provide advice on the establishment of new scholarships schemes
e. review scholarship policy as and when necessary

ELIGIBILITY FOR SCHOLARSHIPS

- Must be Ghanaian or nationals of other African countries
- Must have applied to read one of the KNUST Engineering Education Project (KEEP) advertised programmes

SELECTION MODALITIES

- The scholarship package to be awarded would depend on the applicant's financial need, academic class during the undergraduate degree, technical understanding of the research area, ability to conduct research independently and clarity of thoughts.
- Applicants would apply for the scholarship via the online system
- Female students are given a quota.
- International applicants will be interviewed by Skype or other web-based systems.

SCHOLARSHIP PACKAGES

The scholarship packages may include one or a combination of the following:

- Full Tuition
- Partial Tuition
- Accommodation
- Stipend
- Research grant

• Tuition- Fees that the student is expected to pay. Payment is made directly by the project to the college. The payment may be full or partial depending on the decision of the scholarship committee.

• Accommodation- A place where the student would be lodging is provided. Payment is made directly to the hostel where the student would be lodging on an annual basis.

• Stipend- It is money that is given to the student on a monthly basis for personal upkeep. Regional students are entitled to Seven Hundred and Fifty Ghana Cedis (GH¢750) whilst local students are entitled to Six Hundred Ghana Cedis (GH¢600)

• Research grants are also given to all scholarship students for research/ laboratory support. This is however dependent on the need of the research. MPhil/MSc students are eligible to an amount not exceeding Five Thousand Ghana Cedis (GH¢5000) whilst PhD students are eligible to an amount not exceeding Fifteen Thousand Ghana Cedis (GH¢15000).

TERMINATION OF SCHOLARSHIP

The scholarship would be terminated if;

- The awardee fails to maintain a Cumulative Weighted Average (CWA) of at least 65% at the end of the taught course phase.
- The awardee changes the programme.
- The awardee is found to be a beneficiary of another scholarship.
- The awardee defers the programme.
- The awardee absents him/herself from class without permission.

DURATION OF SCHOLARSHIP

• PhD- A candidate pursuing a PhD programme is entitled to a scholarship package not exceeding a period of three (3) years
• MPhil- A candidate pursuing a MPhil programme is entitled to a scholarship package not exceeding a period of two (2) years
• MSc- A candidate pursuing an MSc programme is entitled to a scholarship package not exceeding a period of one (1)- two (2) years depending on the official duration of the programme.

SCHOLARSHIP CONFIRMATION LETTERS

The Centre will:
• Communicate the results to all applicants who were shortlisted and were interviewed.
• Applicants who are successful should communicate their decision to accept the package or not. The time period for doing this should not exceed one (1) week

UNIVERSITY POLICY

SEXUAL HARASSMENT POLICY

A person has the right and control over his/her sexual desires and preferences and therefore there are international and national laws primarily to protect individuals against sexual exploitation and gender-based violence in any form. In Ghana sexual assaults of any form including rape, defilement, unnatural carnal knowledge and harassment are regarded as serious offences (i.e. first degree felony), that are liable on conviction to a term of imprisonment not less than five years and not more than 25 years (Criminal Offences Act 1960, Act 29; Criminal and Other Offences (Procedure) Act 1960, Act 30). The KNUST in its commitment towards the attainment of zero tolerance to any form of harassment and sexual assaults within its learning, working and living environment has set out this Anti-Sexual Harassment Policy as a framework in consonance with the national and international policies and statutes. The University's Anti-Sexual Harassment Policy seeks to provide a safe and secure environment for all staff, students and employees free from discrimination, intimidation on any grounds and from harassment at work including sexual harassment. The objectives of this policy include promoting a positive environment in which people are treated fairly and with respect; ensuring that harassment and sexual assault are unacceptable amongst all members of the University; providing a framework of support for staff and students who feel they have been subjected to harassment; providing a mechanism by which complaints can, wherever possible, be addressed in a timely way and taking steps to prevent sexual harassment and sexual abuse in the University. For an effective and efficient implementation of its objectives towards the attainment of a zero tolerance for all forms of harassment and sexual assaults, the University's Anti-Sexual Harassment Policy clearly sets out systematic strategies and procedures. These include: institutionalization of an Anti–sexual harassment unit as a sub-unit under the University's Counselling Centre; Anti-sexual harassment Committee which will work in consonance with the university disciplinary committee; informal and formal procedures for addressing harassment which spells out clearly the compliant procedures, investigation processes, hearing, sanctions and disciplinary measures, appeals from decision and appeal procedures. This University policy also provides guidance and support mechanisms for victims, alleged perpetrators and witnesses; confidentiality clauses; roles and responsibility for all stakeholders including students, staff, corporate partners and visitors; preventive actions and tools that include education and awareness creation of this policy and monitoring and evaluation of the policy.

OPEN EDUCATIONAL RESOURCE (OER) POLICY

KNUST envisions that it will be a leading developer of OERs while the use of its own as well as other OERs will become fully incorporated into teaching and learning at all levels within the institution to further ensure that the highest standards of education are achieved. This policy therefore guides the promotion, development and usage of OERs within all colleges and departments of KNUST.

INFORMATION AND COMMUNICATION TECHNOLOGY (ICT) POLICY

To achieve the strategic objectives of the University, it is necessary that there must be ways of interactions and sharing of knowledge within the university as well as the outside world. Information and Communication Technology has been recognised as an efficient tool for achieving these objectives. The increasing role of Information and Communication Technology (ICT) as a vehicle for teaching, learning and research, and also as an important key skill for everyday life, has led to ICT moving towards the core of the University curriculum and also responding to the vision, mission and strategic priorities of the University

For further details, visit
www.knust.edu.gh
www.keep.knust.edu.gh

Visit us at www.coe.knust.edu.gh

coe@knust.edu.gh | Follow CoE -KNUST on