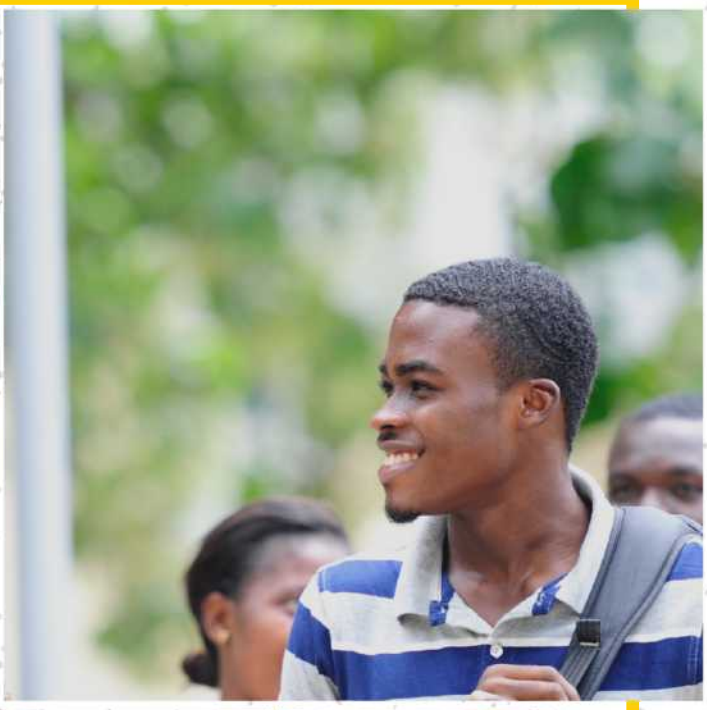
KNUST ENGINEERING EDUCATION PROJECT

KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY, KUMASI



KEEP HANDBOOK

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 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**

KNUST ENGINEERING EDUCATION PROJECT

KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY, KUMASI

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.

POST-GRADUATE ADMISSIONS

RESEARCH THEMES

post-graduate students areadmitted into the following 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

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 biological related activities to meet the demands of agriculture, industry, and rural development.**

Entry requirements

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.

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

MPhil
Computer Engineering

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 requirements

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

• Candidates who do not he 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 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.

	Course Code	Course Name

Year one - Semester one

1	**COE 575**	Broadband Communication Networks
2	**COE 597**	Research Methods and Ethics
3	**COE 585**	Advanced Computer Architecture
4	**COE 557**	Artificial Intelligence

Elective Courses
Elective Courses to be taken by students ()

1	**COE 581**	Advanced VLSI System Design
2	**COE 561**	Optical Communication Systems
3	**COE 581**	Embedded Realtime Operating Systems
4	**COE 583**	Internet of Things Technology

Year one - Semester two

1	**COE 562**	Engineering Systems Design and Modelling
2	**COE 572**	Advanced Digital Signal Processing
3	**COE 592**	Advanced Signal and Communication Theory

Elective Courses
Elective Courses to be taken by students (Select at least one)

1	**COE 588**	Neural Networks and Deep Learning
2	**COE 576**	Networks and Web Security
3	**COE 588**	Intelligent Systems and Robotics
4	**COE 584**	Advanced Software Engineering
5	**COE 568**	Advanced Distributed Systems

Year two - Semester one

1		MPhil Thesis

MPhil
Chemical Engineering

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 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 pr gramme 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 requirements

• 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 synopsisof the research proposal

	Course Code	Course Name

Year one - Semester one

1	**CHE 551**	Advanced Transport Phenomena I
2	**CHE 553**	Advanced Chemical Thermodynamics
3	**CHE 555**	Advanced Process Control
4	**CHE 557**	Fuels and Energy Thechnology
5	**CHE 559**	Mathematics Methods in Chemical Eng
6	**CHE 561**	Seminar I

Year one - Semester two

1	**CHE 552**	Advanced Transport Phenomena II
2	**CHE 554**	Chemical Reaction Enginering
3	**CHE 556**	Separation Processes
4	**CHE 558**	Environmental Engineering
5	**CHE 560**	Process Optimization
6	**CHE 562**	Seminar II

	Course Code	Course Name

Year two - Semester one

1	**CHE 671**	Master Thesis in Chemical Eng. I
2	**XXX xxx**	Elective I

Elective Courses
Elective Courses to be taken by students (Select at least one)

1	**CHE 661**	Biochemical Engineering
2	**CHE 663**	Food Process Engineering
3	**CHE 665**	Advanced Structural Ceramics
4	**CHE 667**	Polymer Processing

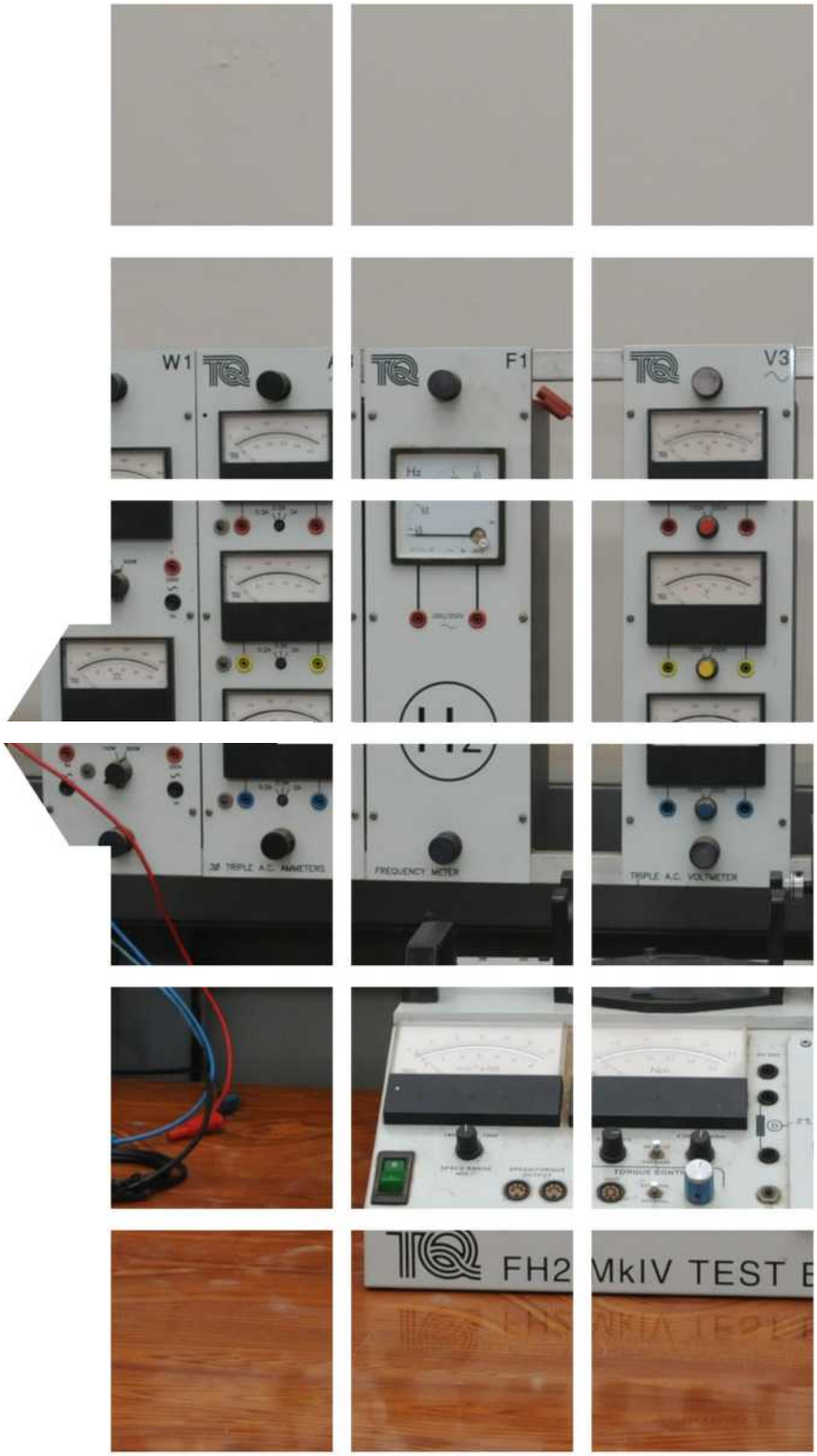
Year two - Semester two

1	**CHE 672**	Master Thesis in Chemical Eng. II
2	**XXX xxx**	Elective II

Elective Courses
Elective Courses to be taken by students (Select at least one)

1	**CHE 660**	Plastic and Composites
2	**CHE 662**	Synthesis of Polymers
3	**CHE 664**	Production and Properties of Explosives
4	**CHE 666**	Pulp Properties Bleaching Processes
5	**CHE 668**	Pulp Processing & Papermaking Operations
6	**CHE 670**	Engineering Statistics

MPhil
Power Systems Engineering



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

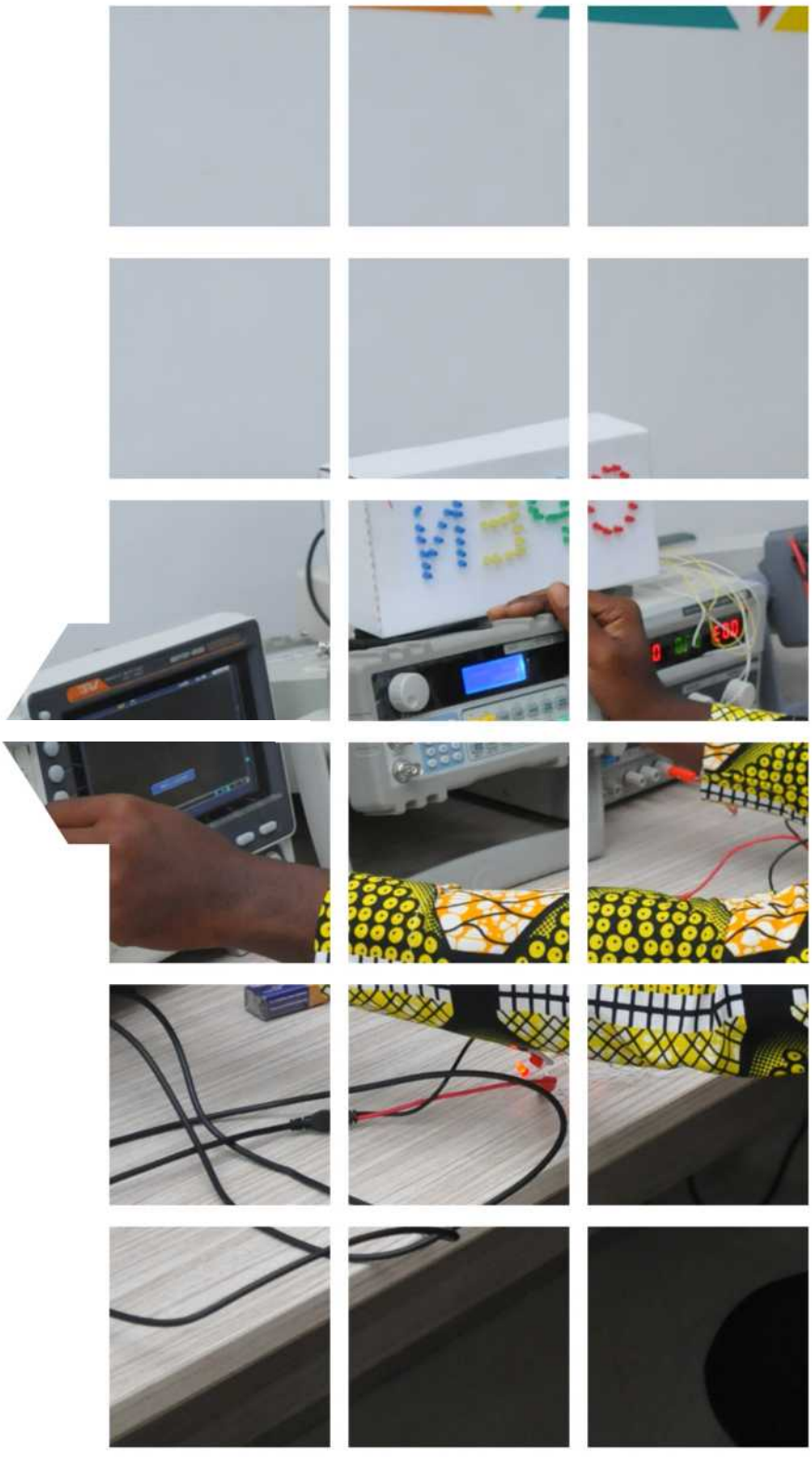
- **provide students with knowledge and skills to plan, design and operate modern electric power tsystems;.**
- **provide graduates with the skill to carry out research in electric power systems.**
- **develop new techniques and tools for improved power system operation.**

Entry requirements

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.

	Course Code	Course Name
Year one - Semester one		
1	**EE 551**	Power System Components
2	**EE 553**	Energy Systems and Analysis
3	**EE 555**	Computational Concepts and Tools
4	**EE 557**	Project Management and Investment Appraisal
5	**EE 559**	Protection of Power Systems
Year one - Semester two		
1	**EE 550**	Electrical Installations
2	**EE 552**	Smart Grids and Energy Management Systems
3	**EE 554**	Power Electronics and Machines
4	**EE 5XX**	Option I
5	**EE 5XX**	Option II
OPTIONS: **Students are required to select two (2) courses from the following:**		
1	**EE 556**	Control Concepts and Methods
2	**EE 558**	New and Renewable Energy Systems
3	**EE 560**	Power Markets and Economics
Year two - Semester one		
1	**EE 691**	Engineering Research Methods
2	**EE 693**	Seminar I
3	**EE 697**	Thesis I
Year two - Semester two		
1	**EE 694**	Seminar II
2	**EE 698**	Thesis II

MPhil
Telecommunication Engineering



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 requirements

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.

	Course Code	Course Name

Year one - Semester one

1	**TE 571**	RF and Microwave Circuits
2	**TE 581**	Digital Networks and Protocols
3	**TE 561**	Digital Signal Processing
4	**TE 563**	Information Theory and Coding

Year one - Semester two

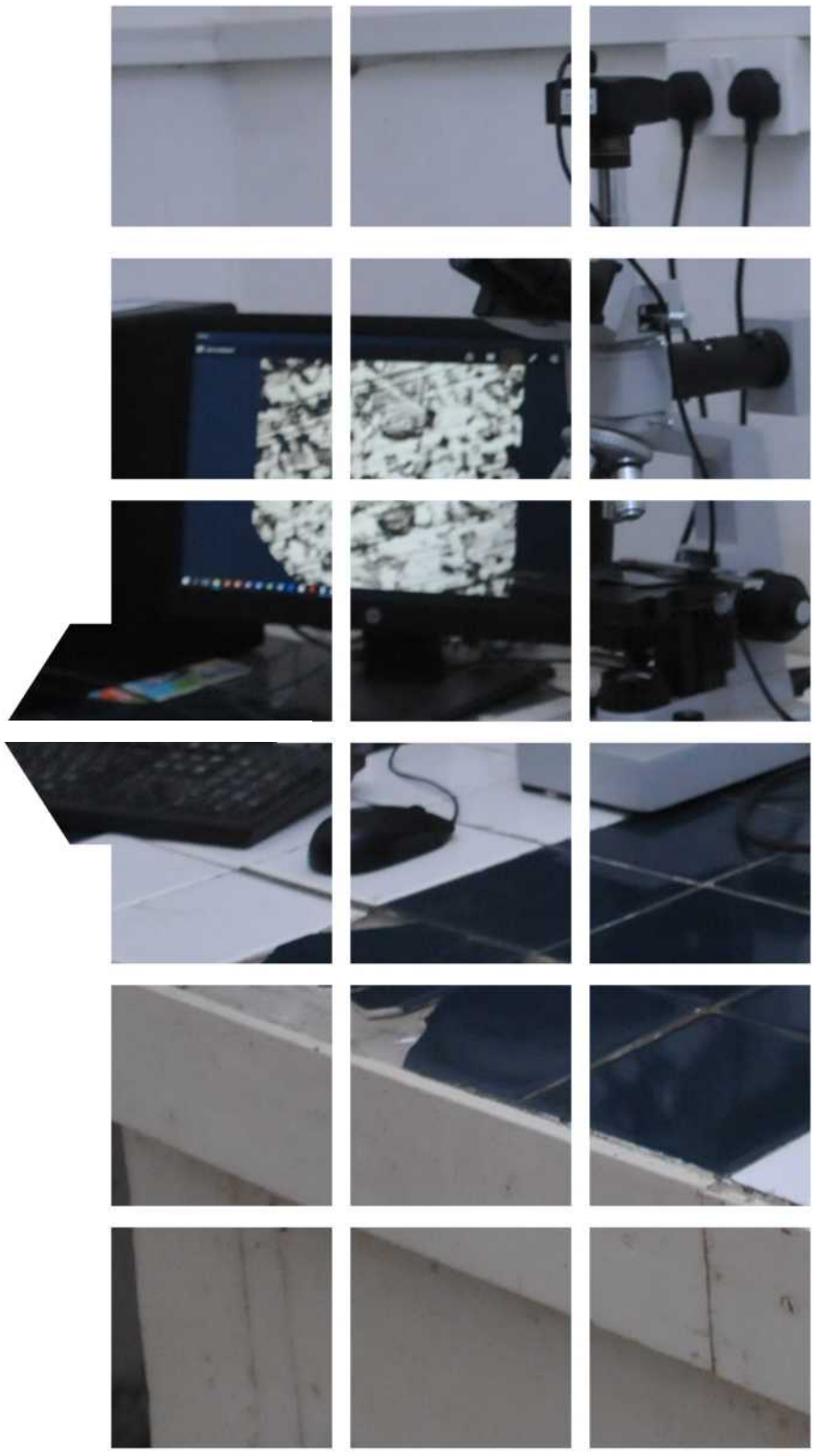
1	**TE 562**	Fiber Optic Transmission Systems
2	**TE 574**	Wireless Communication Networks
3	**TE 576**	Satellite and Broadcast Networks
4	**TE 584**	Network Management and Planning

Year two - Semester one

1	**TE 693**	Seminar I
2	**TE 697**	Thesis I

Year two - Semester two

1	**TE 694**	Seminar II
2	**TE 698**	Thesis II



MPhil
Materials Engineering

MPhil 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**

- **Empower student 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 requirements

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

	Course Code	Course Name

Year one - Semester one

1	**MSE 551**	Thermodynamics of Materials
2	**MSE 553**	Defects, Diffusion and Transformation of Materials
3	**MSE 555**	Solid State Theories of Materials
4	**MSE 557**	Research Methods

Elective Courses
Elective Courses to be taken by students (Select at least one)

1	**MSE 559**	Polymeric Materials
2	**MSE 561**	Ceramic Materials
3	**MSE 563**	Metallic Materials
4	**MSE 565**	Materials Synthesis
5	**MSE 567**	Nanomaterials and Nanotechnology

Year one - Semester two

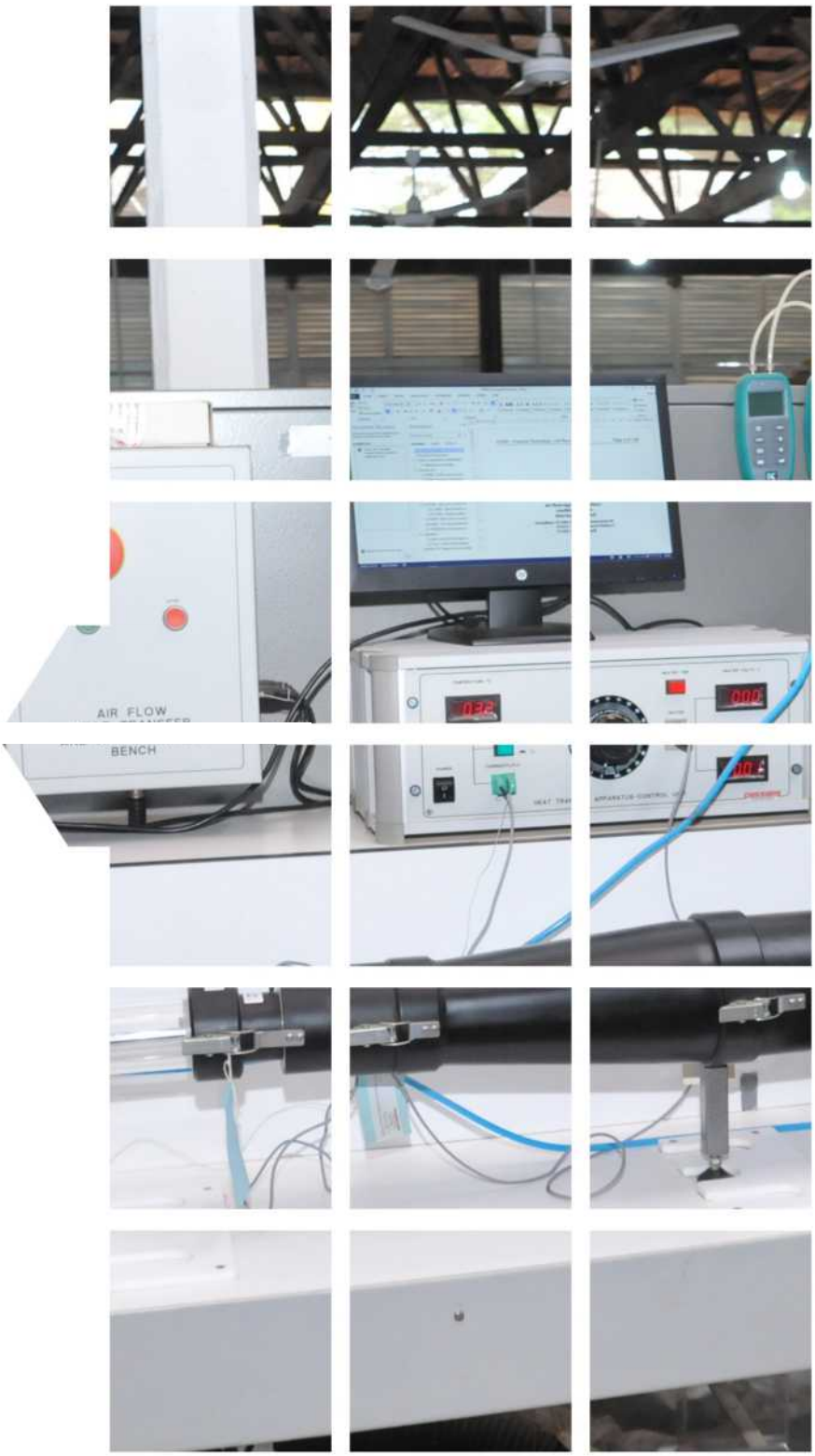
1	**MSE 552**	Interfacial Thermodynamics and Kinetics
2	**MSE 554**	Advanced Materials Characterization
3	**MSE 556**	Materials in Sustainable Development
4	**MSE 558**	Mathematical, Statistical, and Computational Techniques in Materials Science

Elective Courses
Elective Courses to be taken by students (Select at least one)

1	**MSE 560**	Materials for Energy Development
2	**MSE 562**	Composite Materials
3	**MSE 564**	Functional Materials
4	**MSE 566**	Biomaterials

	Course Code	Course Name
Year two - Semester one		
1	**MSE 651**	Thesis I
2	**MSE 653**	Seminar I
Year two - Semester two		
1	**MSE 652**	Thesis II
2	**MSE 654**	Seminar II

MPhil
Renewable Energy Technologies



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-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 requirements

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

	Course Code	Course Name

Year one - Semester one

1	**RET 551**	Introduction to RE Technologies
2	**RET 553**	Entrepreneurship and Small Business Management
3	**RET 555**	Energy Policy, Gender and Planning
4	**RET 557**	Energy and Environment

Elective Courses
Elective Courses to be taken by students (Select two)

1	**RET 561**	Liquid Biofuel Production Systems
2	**RET 563**	Biogas Technology
3	**RET 565**	Solar Thermal Technology
4	**RET 567**	Small Hydropower Technology

Year one - Semester two

1	**RET 552**	Research Methods
2	**RET 554**	Project Analysis and Management
3	**RET 556**	Renewable Energy Laboratory

Elective Courses
Elective Courses to be taken by students (Select at least one)

1	**RET 562**	Solar PV Technology
2	**RET 564**	Wind Power Technology
3	**RET 566**	Bio-energy Technology
4	**RET 568**	Hybrid Energy Systems

Year two - Semester one

1	**RET 651**	Research Project I

Year two - Semester two

1	**RET 652**	Research Project II

MSc
Renewable Energy Technologies

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 requirements

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

	Course Code	Course Name

Year one - Semester one

1	**RET 551**	Introduction to RE Technologies
2	**RET 553**	Entrepreneurship and Business Management
3	**RET 555**	Energy Policy, Gender and Planning
4	**RET 557**	Energy and Environment

Elective Courses
Elective Courses to be taken by students (Select two)

1	**RET 561**	Liquid Biofuel Production Systems
2	**RET 563**	Biogas Technology
3	**RET 565**	Solar Thermal Technology
4	**RET 567**	Small Hydropower Technology

Year one - Semester two

1	**RET 552**	Research Methods
2	**RET 554**	Project Analysis and Management
3	**RET 556**	Renewable Energy Laboratory
4	**RET 558**	Research Project

Elective Courses
Elective Courses to be taken by students (Select at least one)

1	**RET 562**	Solar PV Technology
2	**RET 564**	Wind Power Technology
3	**RET 566**	Bio-energy Technology
4	**RET 568**	Hybrid Energy Systems

MPhil
Scientific Computing & Industrial Modelling

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 requirements

• 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

	Course Code	Course Name

Year one - Semester one

1	**SCIM 551**	Mathematical Foundation
2	**SCIM 553**	Advanced Linear Algebra
3	**SCIM 555**	Mathematical Analysis
4	**SCIM 557**	Measure Theory and Integration
5	**SCIM 559**	Numerical linear Algebra
6	**SCIM 561**	Scientific and Technical Computing
7	**SCIM 563**	Data mining and visualization

Year one - Semester two

1	**SCIM 552**	Methods of Applied Mathematics
2	**SCIM 554**	Dynamical systems and bifurcation theory
3	**SCIM 556**	Partial Differential equations
4	**SCIM 558**	Advanced Scientific and Technical Computing
5	**SCIM 562**	Numerical Solutions for Differential Equations
6	**SCIM 564**	Finite elements methods
7	**SCIM 566**	High performance computing

	Course Code	Course Name

Year two - Semester one

1	**SCIM 565**	Case studies

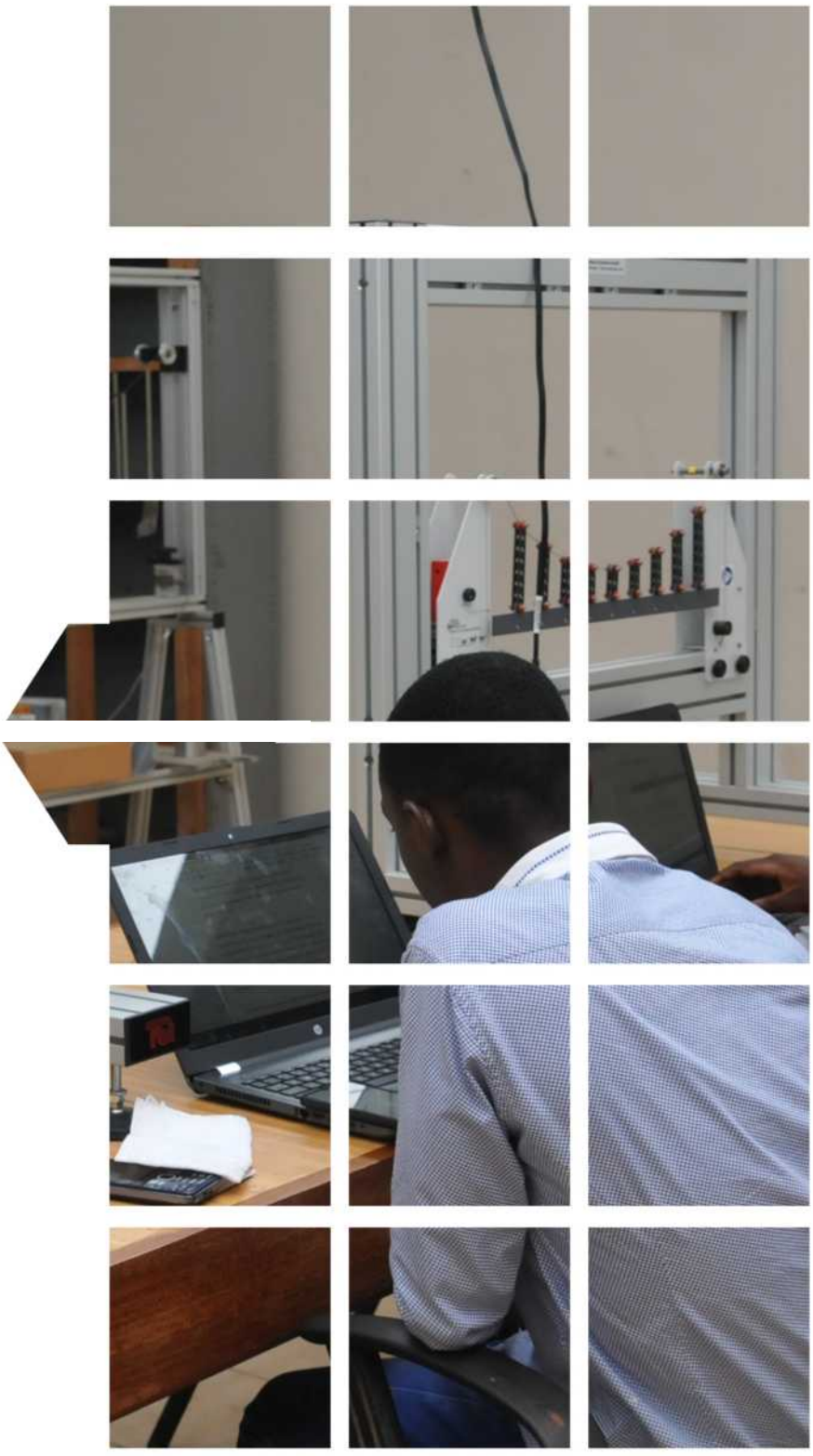
Elective Courses

Elective Courses to be taken by students (Select two depending on the availability of the course)

1	**SCIM 667**	Reservoir simulation*
2	**SCIM 669**	Imaging and Computer Vision*
3	**SCIM 671**	Data visualization*
4	**SCIM 673**	Biomathematical Modeling*
5	**SCIM 675**	Biogeochemical Modeling*
6	**SCIM 677**	Distributed & Grid Computing*
7	**SCIM 679**	Monte Carlo simulation*
8	**SCIM 681**	Computational Fluid Dynamics*
9	**SCIM 683**	Computational Finance*
10	**SCIM 685**	Nonlinear Optimization*

Year two - Semester two

1	**SCIM 598**	Thesis work and report writing
2	**SCIM 600**	Seminar



MSc
Cyber Security & Digital Forensics

MSc
Cyber Security & Digital Forensics

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.**
- **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 requirements

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

	Course Code	Course Name

Year one - Semester one

1	**CSDF 551**	Secure Infrastructure Design
2	**CSDF 553**	Research Methods and Professional Practice
3	**CSDF 555**	Application Security
4	**CSDF 557**	Computer Forensics
5	**CSDF 559**	Cyber Law

Elective Courses
Elective Courses to be taken by students (Select one based on option)

1	**CSDF 561**	Python Security Programming*
2	**CSDF 563**	Digital Forensics Software Tools^

* **Cyber Security Program Elective**
^ **Digital Forensics Program Elective**

Year one - Semester two

1	**CSDF 552**	Cryptography
2	**CSDF 554**	Cloud Systems Architecture
3	**CSDF 556**	Information Security
4	**CSDF 558**	Operating System Security and Forensics
5	**CSDF 560**	Advanced Computer Forensics

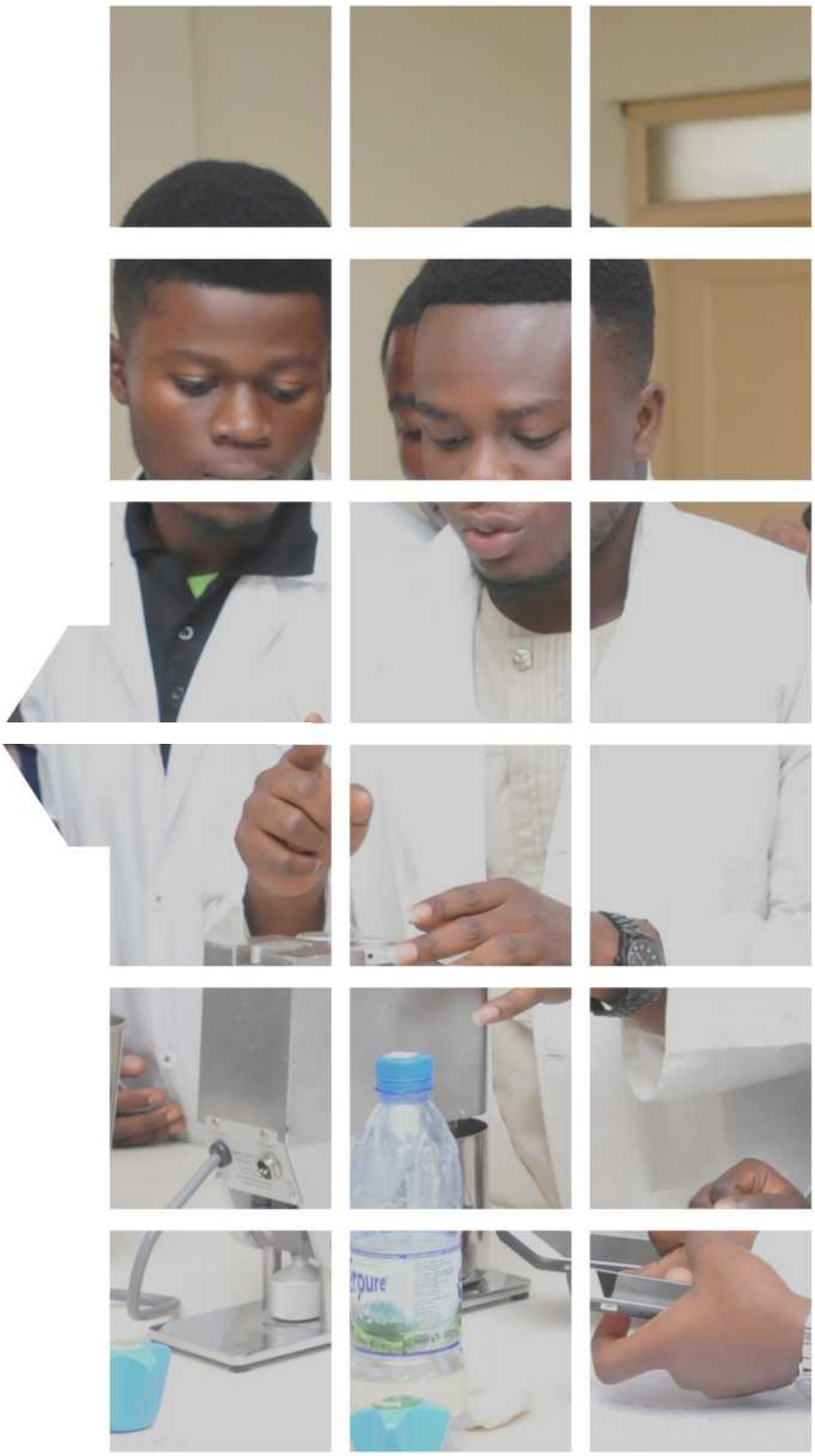
Elective Courses
Elective Courses to be taken by students (Select one based on option)

1	**CSDF 562**	Intelligence and Forensic Analysis^
2	**CSDF 564**	Database Security Management*

* **Cyber Security Program Elective**
^ **Digital Forensics Program Elective**

CSDF 570	THESIS

PhD
BIOENGINEERING



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.**

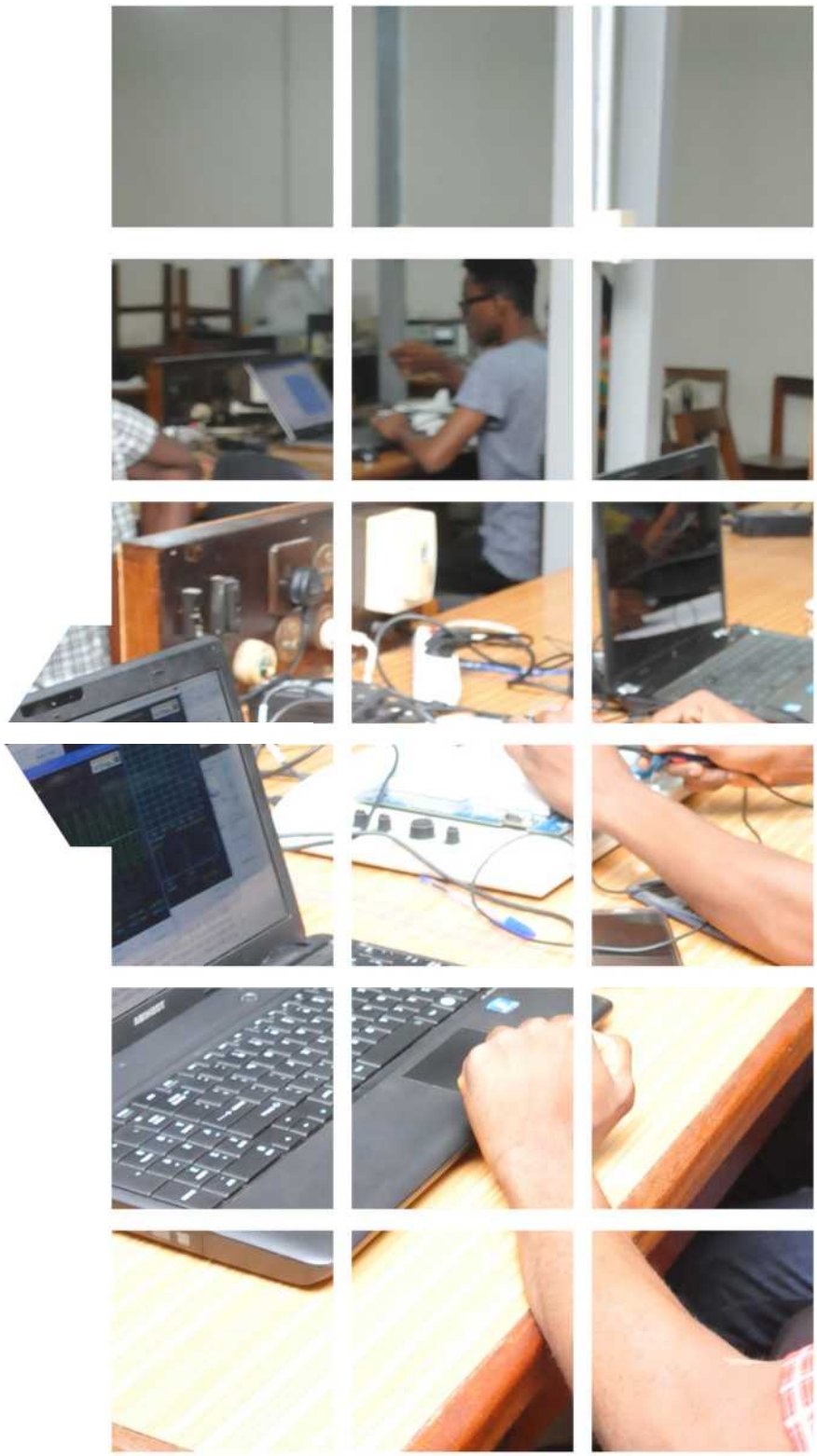
- **The objective of the programme is to provide training in engineering for biological related activities to meet the demands of agriculture, industry, and rural development.**

Entry requirements

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

	Course Code	Course Name
Year one- Semester one		
1	**AE 541**	Research Methods and Instrumentation
2	**AE 543**	Renewable Energy Applications for Rural Development
3	**AE 573**	Wastewater Reuse for Agriculture
4	**AE 597**	Bioethanol and Biodiesel Technology
5	**AE 575**	Bioprocess Engineering
Year one- Semester two		
1	**AE 560**	Advanced Computer Applications
2	**AE 578**	Entrepreneurship Development and Management of Bioenergy Systems
3	**AE 568**	Economic Planning of Renewable Energy Systems
4	**AE 574**	Waste Treatment and Disposal in Developing Countries
5	**AE 566**	Biogas Technology
6	**AE 572**	Thermo-Chemical Conversion of Biomass
Year two - Semester one		
1	**AE 698**	Research Project
Year two - Semester two		
1	**AE 698**	Research Project
Year three - Semester one		
1	**AE 698**	Research Project
Year three - Semester one		
1	**AE 698**	Research Project

PhD
COMPUTER ENGINEERING



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 requirements

• 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.

	Course Code	Course Name

Year one - Semester one

1	COE 575	Broadband Communication Networks
2	COE 597	Research Methods and Ethics
3	COE 585	Advanced Computer Architecture
4	COE 557	Artificial Intelligence

Elective Courses
Elective Courses to be taken by students ()

1	COE 581	Advanced VLSI System Design
2	COE 561	Optical Communication Systems
3	COE 581	Embedded Realtime Operating Systems
4	COE 583	Internet of Things Technology

Year one - Semester two

1	COE 562	Engineering Systems Design and Modelling
2	COE 572	Advanced Digital Signal Processing
3	COE 592	Advanced Signal and Communication Theory

Elective Courses
Elective Courses to be taken by students ()

1	COE 588	Neural Networks and Deep Learning
2	COE 576	Networks and Web Security
3	COE 588	Intelligent Systems and Robotics
4	COE 584	Advanced Software Engineering
5	COE 568	Advanced Distributed Systems

Year two-Year four

1		PhD Thesis

PHD
Chemical Engineering

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 requirements

• Applicants must possess an MPhil degree from a recognizedUniversity. The first degree of the applicant should be First Class orSecond Class (Upper Division) or its equivalent in ChemicalEngineering.

• 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 demonstratethe ability to fund or prove the source of funds for the research.

	Course Code	Course Name

Year one - Semester one

1	**CHE 551**	Advanced Transport Phenomena I
2	**CHE 553**	Advanced Chemical Thermodynamics
3	**CHE 555**	Advanced Process Control
4	**CHE 557**	Fuels and Energy Thechnology
5	**CHE 559**	Mathematics Methods in Chemical Eng
6	**CHE 561**	Seminar I

Year one - Semester two

1	**CHE 552**	Advanced Transport Phenomena II
2	**CHE 554**	Chemical Reaction Enginering
3	**CHE 556**	Separation Processes
4	**CHE 558**	Environmental Engineering
5	**CHE 560**	Process Optimization
6	**CHE 562**	Seminar II

	Course Code	Course Name

Year two - Semester one

1	**CHE 671**	Doctoral Thesis in Chemical Eng. I
2	**XXX xxx**	Elective I

Elective Courses
Elective Courses to be taken by students (Select at least one)

1	**CHE 661**	Biochemical Engineering
2	**CHE 663**	Food Process Engineering
3	**CHE 667**	Polymer Processing
4	**CHE 669**	Nitrocellulose Propellants

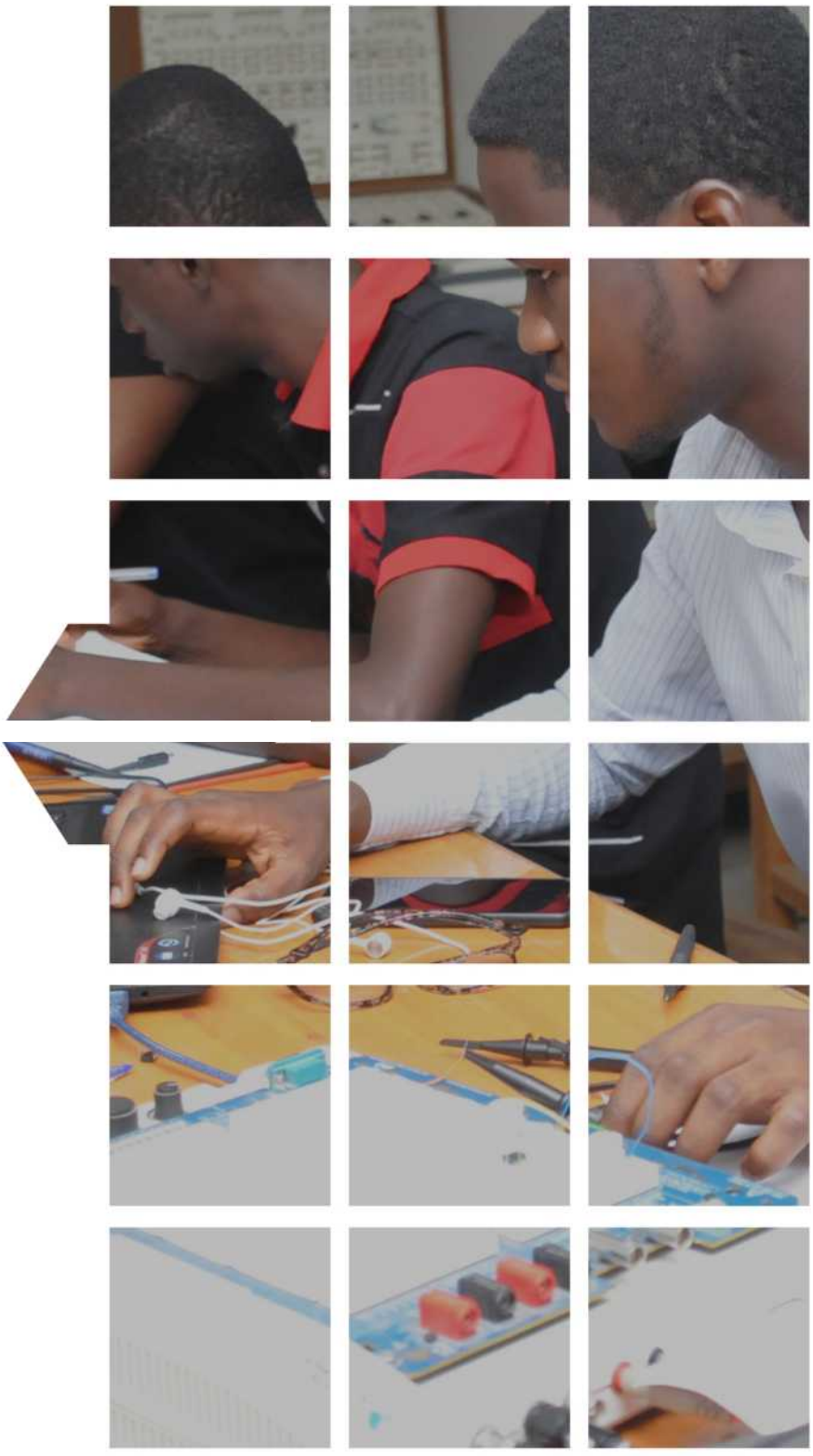
Year two - Semester two

1	**CHE 672**	Doctoral Thesis in Chemical Eng. II
2	**XXX xxx**	Elective II

Elective Courses
Elective Courses to be taken by students (Select at least one)

1	**CHE 660**	Plastic and Composites
2	**CHE 662**	Synthesis of Polymers
3	**CHE 664**	Production and Properties of Explosives
4	**CHE 666**	Pulp Properties Bleaching Processes
5	**CHE 668**	Pulp Processing & Papermaking Operations
6	**CHE 670**	Engineering Statistics

PHD
ELECTRICAL ENGINEERING



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 requirements

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.

	Course Code	Course Name

Year one - Semester one

1	**EE 771**	Computational Concepts and Tools
2	**EE 773**	Engineering research methods

Year one - Semester two

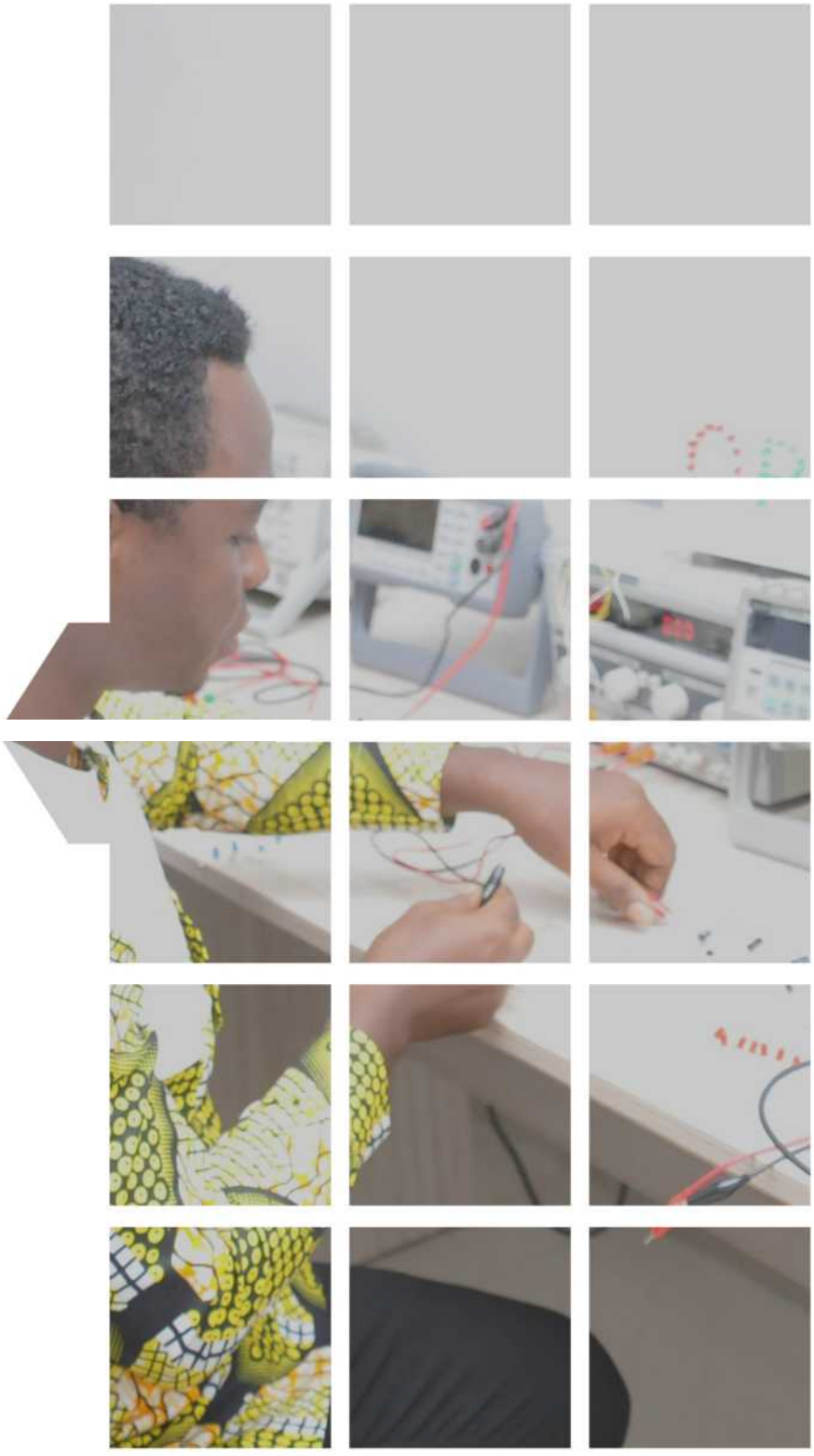
1	**EE 770**	Smart Grids and Energy Management Systems
2	**EE 772**	Research Seminar
3	**EE 7XX**	Option

Elective Courses
Elective Courses to be taken by students (select one)

1	**EE 774**	Control Concepts and Methods
2	**EE 776**	New and Renewable Energy Systems
3	**EE 778**	Power Markets and Economics

Year one - Year four

1	**EE 772**	Research Seminar
2	**EE 873**	Thesis



PhD
Telecommunication Engineering

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 requirements

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.

	Course Code	Course Name

Year one - Semester one

1	**TE 507**	Research Methods
2	**TE 555**	Applied Mathematical Techniques

Elective Courses
Elective Courses to be taken by students (two minimum)

1	**TE 557**	Advanced Statistics
2	**TE 571**	RF and Microwave Circuits
3	**TE 581**	Digital Networks and Protocols
4	**TE 561**	Digital Signal Processing
5	**TE 563**	Information Theory and Coding

Year one - Semester two

Elective Courses
Elective Courses to be taken by students ()

1	**TE 562**	Fiber Optic Transmission Systems
2	**TE 574**	Wireless Communication Networks
3	**TE 576**	Satellite and Broadcast Networks
4	**TE 584**	Network Management and Planning

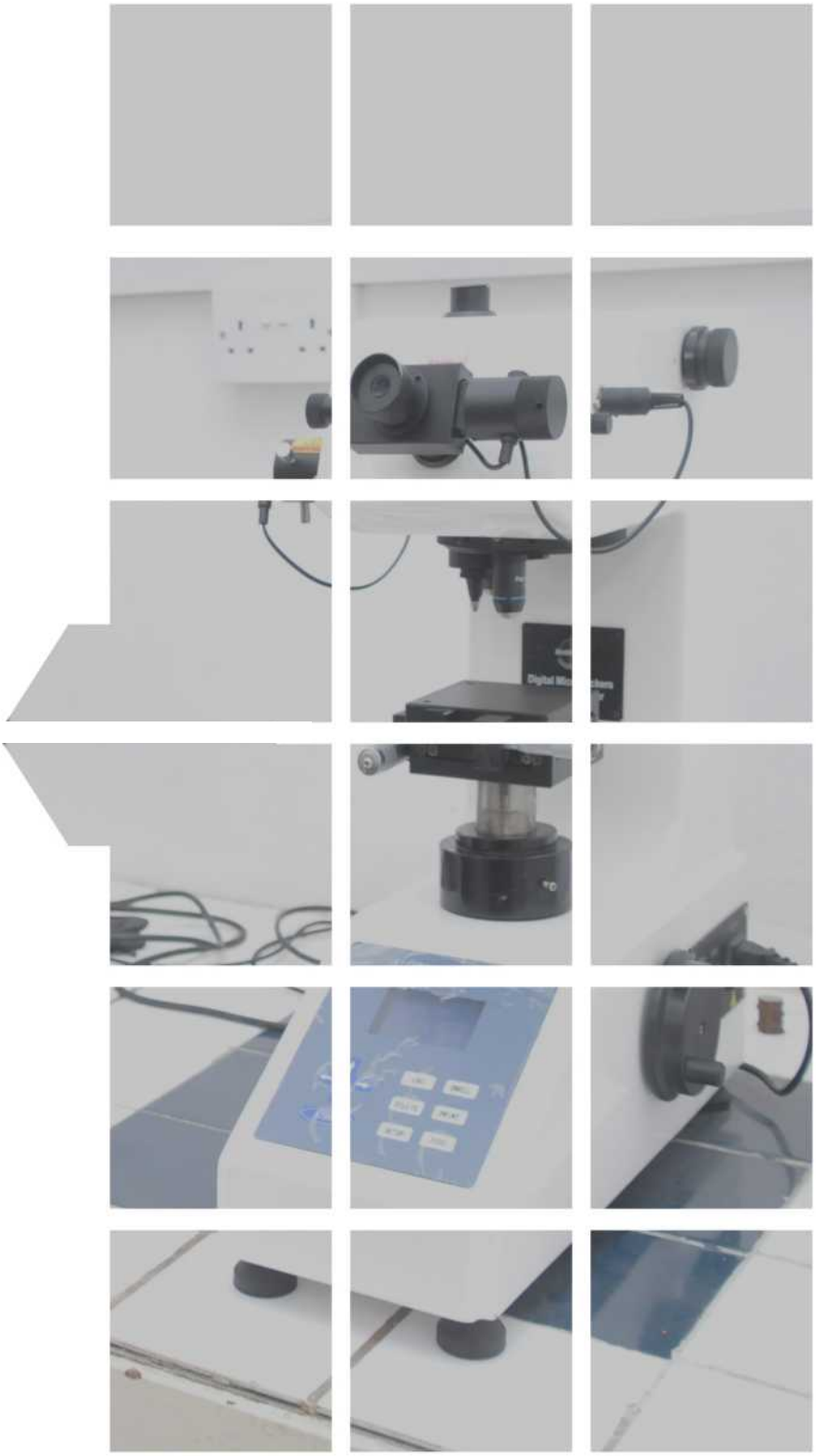
Year two-Year four Semester one

1	**TE 693**	Seminar I
2	**TE 697**	Thesis I

Year two-Year four Semester one

1	**TE 694**	Seminar II
2	**TE 698**	Thesis II

PhD
Materials Engineering



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 requirements

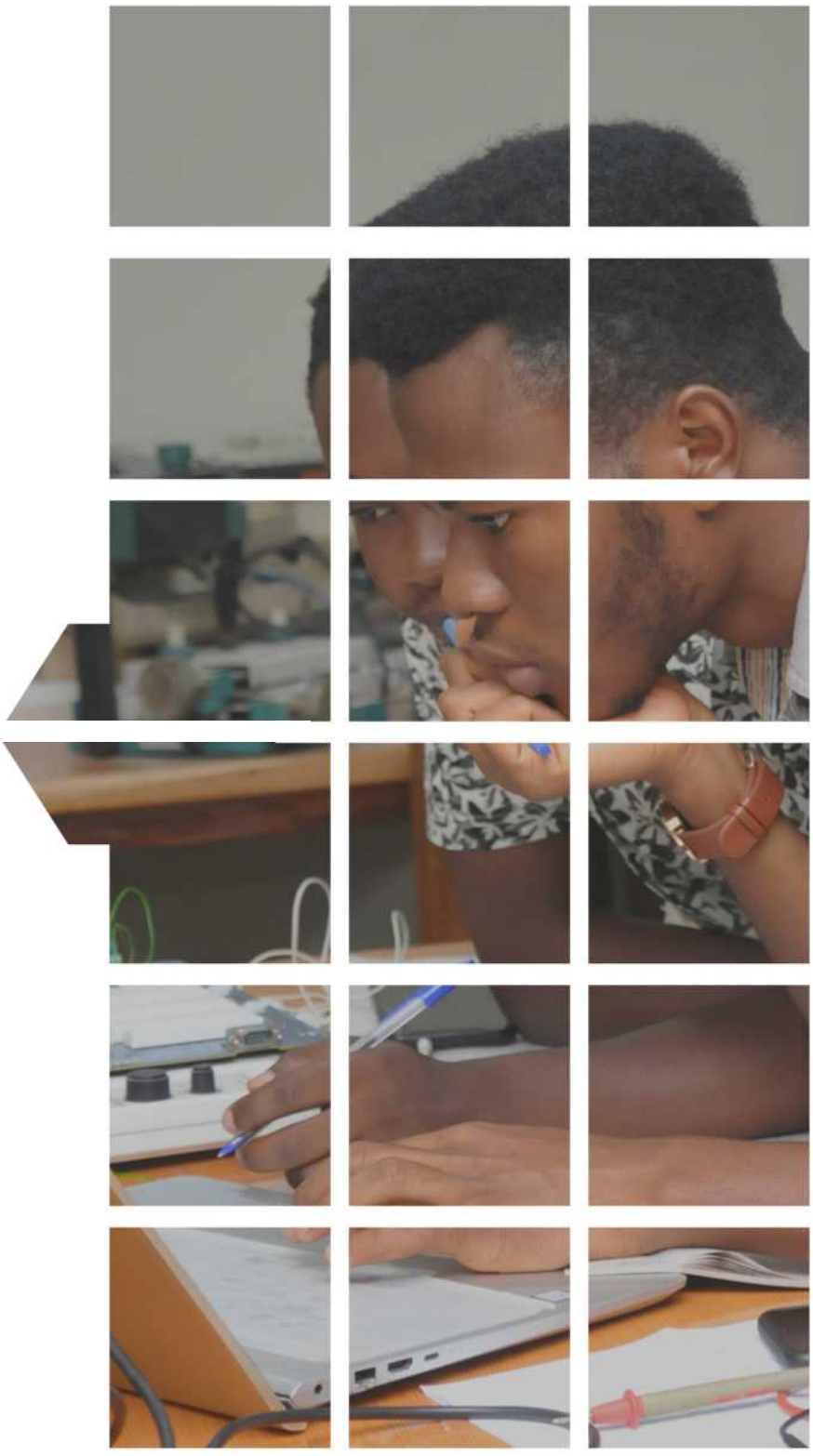
The following shall be the admission requirements for prospective students:

- 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.

	Course Code	Course Name
Year one - Semester one		
1	**MSE 557**	Research Methods
	Elective Courses	
	Elective Courses to be taken by students (at least 4 electives)	
1	**MSE 551**	Thermodynamics of Materials
2	**MSE 552**	Interfacial Thermodynamics and Kinetics
3	**MSE 553**	Defects, Diffusion and Transformation of Materials
4	**MSE 554**	Advanced Materials Characterization
5	**MSE 555**	Solid State Theories of Materials
6	**MSE 556**	Materials in Sustainable Development
7	**MSE 558**	Mathematical, Statistical, and Computational Tech-
8	**MSE 559**	niques in Materials Science
9	**MSE 560**	Polymeric Materials
10	**MSE 561**	Materials for Energy Development
11	**MSE 562**	Ceramic Materials
12	**MSE 563**	Composite Materials
13	**MSE 564**	Metallic Materials
14	**MSE 565**	Functional Materials
15	**MSE 566**	Materials Synthesis
16	**MSE 567**	Biomaterials
17	**XXXX**	Nanomaterials and Nanotechnology
Year two - Semester one		
1	**MSE 851**	Thesis III
2	**MSE 853**	Seminar III
Year two - Semester two		
1	**MSE 852**	Thesis IV
2	**MSE 854**	Seminar IV

	Course Code	Course Name
Year three - Semester one		
1	**MSE 951**	Thesis V
2	**MSE 953**	Seminar V
Year three - Semester two		
1	**MSE 952**	Thesis VI
2	**MSE 954**	Seminar VI



PhD
Scientific Computing & Industrial Modelling

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.**
- **Attract and select students of outstanding quality**
- **Provide an integrated system of teaching and learning tailored towards students needs and the development of the Ghana and the subregion**
- **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 requirements

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

	Course Code	Course Name

Year one - Semester one

1	**SCIM 551**	Mathematical Foundation
2	**SCIM 553**	Advanced Linear Algebra
3	**SCIM 555**	Mathematical Analysis
4	**SCIM 557**	Measure Theory and Integration
5	**SCIM 559**	Numerical linear Algebra
6	**SCIM 561**	Scientific and Technical Computing
7	**SCIM 563**	Data mining and visualization

Year one - Semester two

1	**SCIM 552**	Methods of Applied Mathematics
2	**SCIM 554**	Dynamical systems and bifurcation theory
3	**SCIM 556**	Partial Differential equations
4	**SCIM 558**	Advanced Scientific and Technical Computing
5	**SCIM 562**	Numerical Solutions for Differential Equations
6	**SCIM 564**	Finite elements methods
7	**SCIM 566**	High performance computing

	Course Code	Course Name

Year two - Semester one

1	**SCIM 565**	Case studies

Elective Courses

Elective Courses to be taken by students (Select two depending on the availability of the course)

1	**SCIM 667**	Reservoir simulation*
2	**SCIM 669**	Imaging and Computer Vision*
3	**SCIM 671**	Data visualization*
4	**SCIM 673**	Biomathematical Modeling*
5	**SCIM 675**	Biogeochemical Modeling*
6	**SCIM 677**	Distributed & Grid Computing*
7	**SCIM 679**	Monte Carlo simulation*
8	**SCIM 681**	Computational Fluid Dynamics*
9	**SCIM 683**	Computational Finance*
10	**SCIM 685**	Nonlinear Optimization*

Year two - Semester two

1	**SCIM 598**	Thesis work and report writing
2	**SCIM 600**	Seminar

PHD
SUSTAINABLE ENERGY TECHNOLOGIES

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 requirements

- Applicants with good master's or MPhil degree in Engineering or related field from a recognised University

- In addition, candidates must pass an interview.

	Course Code	Course Name
Year one - Semester one		
1	**RET 551**	Introduction to RE Technologies
2	**RET 553**	Entrepreneurship and Small Business Management
3	**RET 555**	Energy Policy, Gender and Planning
4	**RET 557**	Energy and Environment
Elective Courses **Elective Courses to be taken by students ()**		
1	**RET 571**	Liquid Biofuel Production Systems
2	**RET 573**	Biogas Technology
3	**RET 575**	Solar Thermal Technology
4	**RET 577**	Small Hydropower Technology
Year one - Semester two		
1	**RET 550**	Research Methods
2	**RET 554**	Project Analysis and Management
Elective Courses **Elective Courses to be taken by students ()**		
1	**RET 572**	Solar PV Technology
2	**RET 574**	Wind Power Technology
3	**RET 576**	Bio-energy Technology
4	**RET 578**	Hybrid Energy Systems
Year two - Semester one		
1	**RET 697**	Thesis I
2	**RET 691**	Seminar I
Year two - Semester two		
1	**RET 698**	Thesis II
2	**RET 692**	Seminar II

	Course Code	Course Name

Year three - Semester one

1	**RET 897**	Thesis III
2	**RET 891**	Seminar III

Year three - Semester two

1	**RET 898**	Thesis IV
2	**RET 892**	Seminar IV

Year four - Semester one

1	**RET 997**	Thesis V
2	**RET 991**	Supervised Teaching I

Year four - Semester two

1	**RET 998**	Thesis VI
2	**RET 992**	Supervised Teaching II

KWAME NKRUMAH
UNIVERSITY OF SCIENCE
AND TECHNOLOGY, KUMASI

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 get a Cummulative Weighted Average (CWA) below 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.

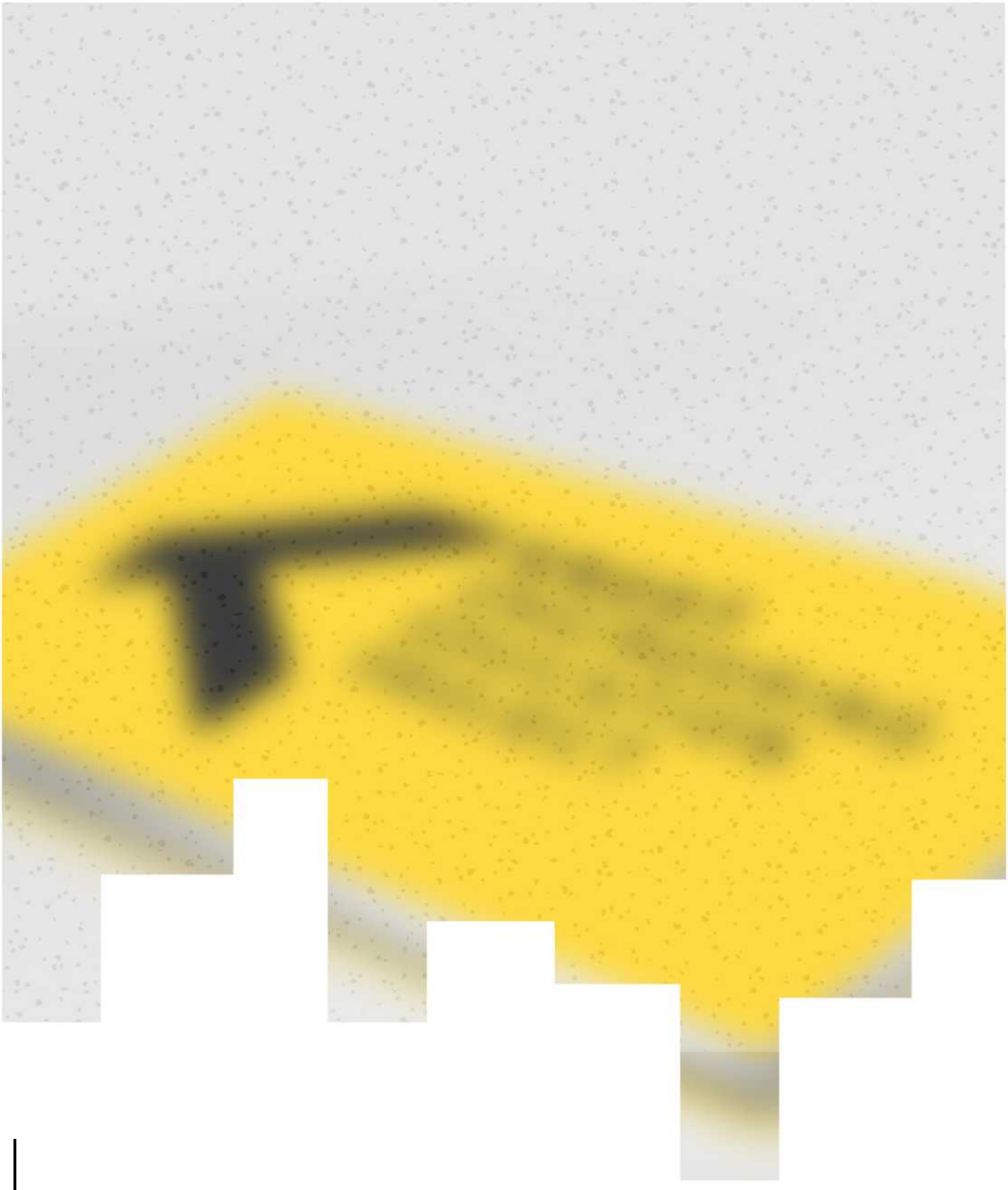
Open Educational Resource (OER) Policy

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
ww.knust.edu.gh
www.keep.knust.edu.gh



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