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DE DÉVELOPPEMENT

FACT SHEET

STEM



Project Commencement: 2019

AFRICA

Higher Education Centres of
Excellence for Development Impact
(ACE Impact)

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African Centre of Excellence in Mathematical Sciences, Computer Science and Applications (CEA-SMIA)

University and Host Country:

University of Abomey-Calavi, Republic of Benin

Centre's Website:

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Primary Thematic Disciplines of the Centre:

- Fundamental Mathematics, Applied Mathematics (Operational Research, Statistics-Probability)
- Informatics (Data Sciences, Signal Processing, Artificial Intelligence, IoT, etc.).

BRIEF DESCRIPTION OF THE CENTRE

The centre offers a diversified training programme aimed at using mathematical and computer tools for development. We can mention the following:

- a. Fundamental and Applied Mathematics / IMSP (Accredited in 2018 for five years)
- b. Operational Research / IMSP (Several components of this offer will be used for the new Masters, such as the Master in Data Sciences)
- c. Statistics and Probability / IMSP (same as for Operational Research; in addition there will be a common core with the FAST Actuarial offer)
- d. Didactics of Science and Technology / IMSP (Emphasis will now be placed on the promotion of mathematics in primary and secondary education)
- e. ICTs: Networks and Telecommunications; Information Systems / IMSP (HCÉRES recommendations are taken into account for the 2020 review. Mutualisation with similar IFRI training courses through joint courses)
- f. Teaching profession / FAST
- g. Software Engineering (similar to Computer Sciences, Software and Systems / IFRI)
- h. Cyber security (similar to Computer Security / IFRI)
- i. Management and information systems (similar to Information Systems and Computer Networks / IFRI)
- j. Internet and Multimedia (IFRI)
- k. Actuarial (FAST)

New offers will be launched. They are:

- a. Master in Mathematical Engineering
- b. Master's degree in Information Systems Management (with SAP and Big Data certification)

- c. Master's degree in Data Science (associated with statistical/applied mathematics)

KEY OBJECTIVES AND EXPECTED RESULTS

This Centre is in line with the priorities of the Government of Benin, which aims to use ICTs as a catalyst for economic dynamics and modernization to accelerate economic growth and social inclusion. The medium-term challenge is to make Benin a platform of digital services for the whole of West Africa.

The setting up of this centre will meet the need to increase the quality and quantity of Master's and PhD training courses in Mathematics and Applications (operational research, bio-statistics, economics and statistics), by making them more accessible to students in the sub-region, and will also provide better supervision of students in the sciences of massive data (Big Data), the Internet of Things (IoT) and digital sciences, based on the supercomputer acquired within the framework of CEA 1.

KEY CAPABILITIES

CEA-SMIA is hosted by the Institute of Mathematics and Physical Sciences (IMSP) of the University of Abomey-Calavi. The Institute has a campus of more than fifteen hectares with :

- Several classrooms and an auditorium with about 300 seats
- Three rooms equipped for videoconferencing (distance learning courses)
- An equipped library with several thousand books, but also a subscription to online magazines and newspapers.
- Two fifty-seater buses for student transport
- A supercomputer with an initial storage capacity of 250 TB and a computing capacity of approximately 30 Teraflops (possibility of performing 30,000 billion floating point operations per second).

MAIN ACHIEVEMENTS TO DATE

- Recruitment of Master's and Doctoral students in the different fields,
- Organizations of international scientific meetings
- Implementation of new training offers
- Reorganization of the project implementation team


MAJOR REGIONAL AND GLOBAL PARTNERS

Among the very active institutional partnerships, it is important to note those existing with the Pierre and Marie Curie University and the University of Lille 1. Partnerships are concluded with the universities of Burundi, Cameroon, Mali and Niger, within the framework of the pooling of resources for training and the co-supervision of dissertations and theses. Several dissertations have been the subject of joint supervision between local researchers and their counterparts from foreign universities.

In support of these institutional partnerships, mention should be made of the strong support of exchanges from the Beninese diaspora in Europe, the USA and Canada, with their participation in the Centre's scientific council.

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Regional Water and Environmental Sanitation Centre Kumasi (RWESCK)

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Centre's Website:

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Primary Thematic Disciplines of the Centre:

- Water and Environmental Sanitation Engineering, Technology, Resilience Systems and Management.

BRIEF DESCRIPTION OF THE CENTRE

The Regional Water and Environmental Sanitation Centre Kumasi (RWESCK) is an innovative research and development (IR&D) centre with the vision to be a recognized hub for advancing research knowledge, developing innovative technologies, providing high-quality training in water, sanitation and hygiene (WASH) for sustainable development of West Africa.

Our core mandate is to develop products, systems and innovative technologies related to WASH as well as strengthen the human resource capacity in Ghana and the sub-region in WASH.

Our areas of expertise include modelling, designs and management of systems for water resources, climate resilience, water treatment, water distribution, waste management and environmental sanitation.

RWESCK's cutting edge innovative research and product development include climate resilience models, water resource prediction models, water instrumentation, adsorptive filter materials, membrane technology, coagulating materials, macrophytes/biomaterial remediation, food waste-to-animal feed products, organic compost fertilizer products, and sludge digestion treatment.

The membrane, nanomaterials and adsorptive filter materials (coated sand media, synthetic zeolites, coated activated carbon, etc.) are being developed for the removal of contaminants from industrial and municipal wastewaters as well as removal of heavy metals, iron, manganese, fluoride, arsenic, chloride, chromium, etc. from drinking water.

KEY OBJECTIVES AND EXPECTED RESULTS

The strategic objectives are:

- Provide high-quality postgraduate education (Ph.D. and Masters) and professional training
- Conduct cutting-edge and innovative research into products development in key thematic areas in Water and Environmental Sanitation.
- Nurture early-career researchers to hone their skills in impact-oriented innovative research and publication in high impact journals.

Expected Outcome:

- Train over 56 PhD and 100 Master students
- Train over 180 National and 100 Regional participants in professional short course skills training
- Establish Women in Water and Sanitation Association and mentorship programme
- Hold the 2nd Regional Water and Environment Conference
- Strengthen regional partnerships through faculty exchange programme, visiting professors and guest lecturers, and Joint training-of-trainers, and Research Supervision,
- Strengthen Business Incubation, start-up support, marketing and patenting of innovative research outputs such as organic fertilizer, biofeed, and package water treatment plant, biomaterials rotary drum dryer,
- Industry-RWESCK joint technology development and industry-outreach Learning Alliance (NLLAP), advocacy on development challenges and research findings,

KEY CAPACITIES

- High caliber Centre fellows from national and international faculty with competence in water and environmental Sanitation.
- Setting up state-of-the-art water and environment laboratory and water resources/weather station with full analytical capability,
- Ultramodern teaching aids and learning environment, Library and Research Commons
- Strong Industry-Centre joint technology development effort and outreach Learning Alliance
- Strong institutional support and autonomy to attract funding and investment for technology development and business start-ups in organic fertilizer, poultry feed, membrane filters, nanomaterials, adsorptive filter materials and package water treatment plant and biomaterials rotary drum dryer

MAJOR ACCOMPLISHMENTS TO DATE

- The Centre has obtained international accreditation from AQAS, Germany, for all its programmes; 3 Ph.D. and 4 MSc/MPhil programmes.
- The Centre has built an ultramodern facility and equipped its laboratory with state-of-the-art equipment to enhance research, teaching and learning environment,
- The Centre has enrolled 76 Doctoral students (62 national, 14 regional), 206 Masters Students (167 national, 39 regional),
- Over the last five years, 715 professionals have received training in various WASH courses.
- The Centre is developing poultry feed from waste, absorption and nanomaterials for water and wastewater package treatments, and prediction models for climate resilience and water resources.

PRIMARY REGIONAL AND GLOBAL PARTNERS

1. UNESCO IHE, Delft, The Netherlands,
2. Trier University of Applied Sciences, Germany
3. Hohai University, China
4. University of Benin, Nigeria
5. National Water Resources Institute, Nigeria
6. University Cheik Anta Diop, Senegal
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8. Felix Hophouet Boigny University, Cote D'Ivoire



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Obafemi Awolowo University ICT-Driven Knowledge Park (OAK-Park)

**University and Host Country:**

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Primary Thematic Disciplines of the Centre:

- Science, Technology, Engineering and Mathematic (STEM)

BRIEF DESCRIPTION OF THE CENTRE

The Center is established to tackle the twin problems of insufficient output from the engineering training institutions in meeting national and regional requirements, and that of poor quality and lack of practical experience and skills of the graduates produced, which often make them unemployable.

The Center will employ emerging engineering training and research model to strengthen the dimensions of OAK-Park to train high quality engineering manpower, who will recognize, understand, and readily exploit the immense potentials of emerging modern global technology movements, as a revolutionary milestone leveraging the creative and innovative capabilities of the African youth.

KEY OBJECTIVES AND EXPECTED RESULTS

Key Objectives:

- i. Develop OAK-Park into an acknowledged Center of Excellence in transformational engineering design education for development;
- ii. Focus on practice-anchored intelligent engineering education that will produce a critical mass of future teachers/instructors for the new vision, as well as a new corps of engineering leaders to drive the vision of “the Africa we want”;
- iii. Apply and strengthen modern engineering design methodologies emerging from application contexts such as IoT, autonomous systems/machine intelligence, and Industry 4.0, to suit and accelerate the advanced skills development in the region;
- iv. Expand learning and research opportunities for postgraduate studies in all the key sectors consistent with the SDGs, by deploying existing and new advances in ICT; and

- v. Leverage the cognate intellectual infrastructure and the output of the university and collaborating partners to serve as the launch pad for start-up digital/engineering companies.

Expected Outcome

The results to be achieved are as follows:

- a. Eight grants will be attracted to support postgraduate research.
- b. 326 postgraduate students will be produced (National, Regional, Female).
- c. Six research innovations to be patented.
- d. 18 short courses/ 600 trainees to be produced.
- e. 300 postgraduate students and faculty will participate in outreach programs.
- f. Six spin-off companies will be established.
- g. Co-hosting fifty technology driven companies.
- h. Three Business incubator to be established/150 entrepreneurs will be trained





KEY CAPACITIES

- **Telepresence:** for virtual meeting experience and lecture delivery to large classes and to students in remote locations.
- **Cloud Computing:** for housing the standard mobile application and online teaching and learning resources developed.
- **Software Development Studio:** used by software developers and postgraduate students to develop mobile application and online teaching and learning resources
- **Cyber Security laboratory:** used by researchers in Data Communication and network security
- **Computer Engineering/Intelligent System Engineering Equipment:** used by researchers in Computer Engineering/ Intelligent System Engineering
- **Fabrication Laboratory:** used by one of the registered spin-off company to produce various Internet of Things devices

MAJOR ACCOMPLISHMENTS TO DATE

- The Center now embarked on International Accreditation of Postgraduate programmes
- Establishment of a fabrication laboratory within the Centre
- The Center through one of the spin-off companies established under ACE 1 designed and implemented the following: Finger print machine. Software controlled Ventilator, Face masks, Drone, Microcontroller, etc.
- 60% of the regional students that graduated in 2019 now applied to resume for Ph.D. degree program



PRIMARY REGIONAL AND GLOBAL PARTNERS

1. Ecole Supérieure Multinationale des Télécommunications, Dakar, Senegal
2. Laboratoire de Recherche en Informatique et Télécoms, Abidjan, Côte d'Ivoire
3. Massachusetts Institute of Technology, USA
4. McMaster University, Canada
5. Towson University, USA
6. University of Waterloo, Canada
7. Quanser Technologies, Toronto, Canada
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Africa Center Of Excellence In Oilfield Chemicals Research (ACE-CEFOR)

University and Host Country:

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Primary Thematic Disciplines of the Centre:

- STEM

BRIEF DESCRIPTION OF THE CENTRE

The Africa Center of Excellence in Oilfield Chemicals Research (ACE-CEFOR), University of Port Harcourt, aims to develop the Nigerian Oil and Gas industry (in particular) and those of other African countries (in general) where oil and gas have been discovered.

ACE-CEFOR operates on the basis of Triple Helix model of government-academia-industry partnership and thus creates a research network of higher institutions for knowledge and technology transfer. The postgraduate courses and research are designed, organized and taught on modular basis with teaching responsibility shared amongst experienced and active resource persons from the collaborating universities and industry partners.

The industry partners are involved in our curricula review and provide places for, at least, one month internship placement for our postgraduate students and faculties. Therefore, our strong university-industry relationships with the resultant cross-fertilization of ideas have continued to be a veritable source of solutions to development challenges especially as they relate to the oil and gas sector.

KEY OBJECTIVES AND EXPECTED RESULTS

- Promote home grown and regional research networks that will develop human capital in Africa.
- Strengthen human capacity and serve as training hub for Oil and Gas industry workforce in Africa.
- Fill gaps in labor market demands for skills within these specialized areas.
- Increase capabilities of faculties and students in Africa through quality postgraduate education, knowledge transfer and internship programmes.
- Run short courses in Petroleum Engineering and related disciplines.

KEY CAPACITIES

- Modular Refinery laboratory housing a pilot plant
- Drilling Engineering Laboratory, Production Engineering Laboratory and various laboratory equipment at the Central University Laboratory
- Language Laboratory comprising 31 state of the art internet enabled computer equipment
- E-library with 60 internet-enabled computer equipment
- Video conferencing facilities and full internet facilities.
- Learning Management System for on-line

MAJOR ACCOMPLISHMENTS TO DATE

- Graduated 106 (made up of original 48 + 58 in 2020) PhD students, 509 MSc students and trained 884 short course participants
- The Center has published over 280 high quality technical papers
- ACE-CEFOR received national accreditation in 2017 from the National Universities Commission (NUC) for 12 of its post graduate programmes
- The ACE-CEFOR ultra-modern building was completed and commissioned in 2018
- ACE-CEFOR secured international accreditation for three of its programmes in 2019.

REGIONAL AND GLOBAL PARTNERS

1. RUFORUM, Makerere University, Kampala, Uganda
2. University of Mines & Technology (UMaT), Tarkwa, Ghana
3. International Center of Insect Physiology & Ecology, Nairobi, Kenya
4. Halliburton Energy Services
5. Witwatersrand University, Johannesburg, South Africa
6. IFP School, Paris, France
7. Total E&P
8. Shell Petroleum Development Company
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Centre of Excellence in Mathematics and ICT (CEA-MITIC)

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Primary Thematic Disciplines of the Centre:

- Secure networks and systems with mobility (including the Internet of Things);
- Modeling of complex systems
- Mathematics and modeling
- Materials-components-systems
- Computer systems and knowledge (including artificial intelligence)

BRIEF DESCRIPTION OF THE CENTRE

CEA-MITIC is housed at Gaston Berger University in Saint-Louis, Senegal. Its mission is to contribute to the development of science, technology, engineering sciences and mathematics (STEM), the professionalization of training oriented towards the job market and the orientation of research towards the productive sectors in Senegal and Africa.

The center offers training in professionally oriented fields in the fields of IT, telecommunications, applied mathematics and renewable energy. At the doctoral level, there are three doctoral courses (mathematics and applications,

Informatics, Physics and Engineering Sciences) who have produced more than a hundred doctoral students in fields covering artificial intelligence, Big Data, the Internet of Things and cyber security and mathematical modeling. In this context, CEA-MITIC is part of the PASET program following a competition open to African Centers of Excellence. PASET is an initiative of African countries supported by the World Bank to train 10,000 Doctors in STEM within 10 years and to stimulate innovation and the mobility of researchers. CEA-MITIC currently has 54 teacher-researchers in the affiliated establishment and more than 250 researchers in the consortium.



KEY OBJECTIVES AND EXPECTED RESULTS

Key Objectives:

- The development of human capital through initial training (Master and Doctorate levels) and continuous training (short-term qualifying training) in the fields of applied mathematics, computer science, electronics, telecommunications, renewable energies, of the digital economy and entrepreneurship
- Strengthening research capacities and expertise in research units in order to develop research activities that can produce knowledge and innovative solutions in connection with the productive sectors (agriculture, environment, health, digital economy) and enhance the results obtained;
- Boosting the synergy between higher education and research institutions and the socio-economic environment evolving in the fields of mathematics, computer science and ICT, at national and regional level

The Expected Results are:

- competent human resources in STEM fields are trained;
- joint research projects are implemented;
- research results are valued;
- efficient technical platforms are set up and shared;
- teacher and student exchanges are carried out;
- multiple and lasting collaborations are established between the different partners;
- the institutional intervention capacities of national and regional non-academic partners are strengthened.



KEY CAPACITIES

- A new CEA-MITIC building fully equipped and dedicated to teaching and research in the field of MITIC;
- Threelaboratoriesequippedinthe field of embedded systems, cyber security and telecoms; 4 physics laboratories equipped for practical work in general physics, electronics and telecommunications;
- University library which has more than 75,000 works with, in addition a subscription to international journals and online databases;
- An incubator for student projects and the promotion of research at partner level;
- A 240-hectare university campus, including a social campus housing around 12,000 students (university pavilions; restaurants; sports complex; medico-social service, etc.);

MAJOR ACCOMPLISHMENTS TO DATE

- Over 1000 students enrolled in Master and Doctorate level training during the first phase of ACE-1
- Propulsion of the Saint-Louis Numérique 2025 project whose objective is ultimately to develop Saint-Louis as an industrial center based on digital technology.
- A new functional building dedicated to teaching and research in the fields of MITIC with functional laboratories in the fields of MITIC;
- Two courses with international accreditation and national accreditation
- An increasingly strong partnership with the socio-economic community

PRIMARY REGIONAL AND GLOBAL PARTNERS

1. The University of Gambia (Gambia),
2. The University of Kara (Togo),
3. AUST (Nigeria),
4. The Faculty of Sciences and Techniques of Nouakchott,
5. INSA Rennes,
6. The University of Pau and Pays de l'Adour,
7. The University of Paris Dauphine,
8. The National School of Computer Science for Industry and Enterprise (ENSIIE)



PRIMARY RESEARCH FACULTY MEMBERS

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African Center of Excellence for Water and Sanitation (C2EA)

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Primary Thematic Disciplines of the Centre:

- Water
- Sanitation
- Climate Change

BRIEF DESCRIPTION OF THE CENTRE

The Africa Center of Excellence for Water and Sanitation (C2EA) aims to provide Africa with a center of competence, expertise and innovation on water and sanitation.

This pole intends to take up the challenge of training highly qualified competent personnel (PCHQ) capable of solving the various operational problems which arise in the various countries of West and Central Africa while taking into account climatic specificities, geological and spatial of each country. The holistic approach to the issue of water and sanitation on the one hand, the taking into account of technological innovations in management and governance on the other hand, are chosen to respond effectively to this objective.

Concretely, the C2EA meets the needs of governments, companies, local communities in hydrologists, hydraulic engineers, hydrogeologists, water and sanitation specialists, sector and legal economists.

Thus, in initial training at both master's and doctoral level or in short-term continuing education, efforts are concentrated on optimizing and strengthening the programs offered by the INE today and the creation of new complementary programs according to the needs, with a particular focus on hydrology / hydrogeology, hydraulics, hydro-informatics, electromechanical systems, governance and water management, risk and disaster management related to water and entrepreneurship.

KEY CAPABILITIES

- 12 classrooms with 1000 seats
- 03 research laboratories
- 03 university restaurants
- 1 multi-sports stadium (football, basketball and handball)

KEY OBJECTIVES AND EXPECTED RESULTS

The African Center of Excellence for Water and Sanitation (C2EA) aims to provide Africa with a center of competence, expertise and innovation in the field of water, sanitation and climate change.

The project specifically aims to:

- o strengthen research carried out on crucial water, sanitation and climate change issues in order to provide innovative solutions and technologies for the mobilization and sustainable management of water resources, management and treatment water for domestic, industrial and agricultural needs;
- o strengthen the quality of scientific and technological training in the fields of water, sanitation and climate change provided by the Center of Excellence and its partners to better meet the economic and social needs of the continent;
- o increase the number of African students benefiting from high-level Masters and Doctorate training in the fields of water, sanitation and climate change, taking gender and geographic representation into account;
- o facilitate access for professionals in the water and sanitation sector to higher quality training by offering qualifying and diploma training;
- o promote entrepreneurship through incubation centers.

MAIN ACHIEVEMENTS TO DATE

- Preparation of the student booklet;
- Preparation of the Manual of administrative and financial procedures;
- Recruitment of new master students and organization of courses;
- Recruitment of doctoral students and start of research activities

MAIN REGIONAL AND GLOBAL PARTNERS

- Joint Research Center of the European Union
- Global Water Partnership, West Africa, Burkina-Faso
- Research Institute for Development (IRD), France
- Institute of Environmental Geosciences (IGE), France
- Institut National Polytechnique Houphouët-Boigny (INP-HB), Yamoussoukro, Cote d'Ivoire
- UNESCO-IHE, Delft, Netherlands

PRIMARY RESEARCH FACULTY MEMBERS

- | | |
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Africa Centre of Excellence on Technology Enhanced Learning (ACETEL)

University and Host Country:

National Open University of Nigeria (NOUN), Nigeria

Centre's Website:

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Centre Director:

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Primary Thematic Disciplines of the Centre:

- The development of digital experts, ICT tools and solutions and adoption of innovative technologies to ensure access to quality, secure and cost effective learning

BRIEF DESCRIPTION OF THE CENTRE

Africa Centre of Excellence on Technology Enhanced Learning (ACETEL) established in February, 2019 is a World Bank assisted project supported by the Association of African Universities (AAU), and National Universities Commission (NUC), Nigeria. Domiciled in the National Open University of Nigeria (NOUN), - the only single-mode Open and Distance Learning (ODL) institution in Nigeria and the West Africa sub-region.

The Centre focuses on the development of human capacity and research in digital solutions that will lead to the utilisation of technology for education and its deployment to other sectors. The Centre seeks to bridge the technology knowledge gap through postgraduate education to develop capacity in digital policies, tools and solutions that will drive the adoption and use of ICTs in safe, secure and innovative ways in the education landscape with application to other sectors. The Centre will contribute to the optimisation of the continent's research and innovation potential thereby building the next generation of digital experts (researchers and professionals) that will drive economic growth and transformation in the West African sub- region and beyond.

KEY OBJECTIVES AND EXPECTED RESULTS

The Centre seeks to achieve its objective of bridging the technology-knowledge gap through skill based capacity building, postgraduate programmes (Artificial Intelligence, Cyber Security and Management Information System) and research to develop capacity in digital skills, tools and solutions that will drive the adoption and use of ICTs in safe, secure and innovative ways. The expected outcomes of the Centre activities includes:

1. Being a world class resource centre for e-learning strategies and Virtual Learning

Environment for research and development projects in fields such as virtual laboratories, software applications, simulation and animation to increase proficiency in teaching and learning of STEM courses with application to all sectors;

2. A pool of digital experts and skilled graduates in software research and development, animation and digital simulations and interactive learning that will build capacity in the region;
3. A safe and secure digital environment and tools for conduct of virtual activities in the university and provides support to other institutions in the West African sub-region
4. The adoption of best practices in curricula development that integrate pedagogical and instructional design that is learner-centred and enhances learning, research and applied development in the University;
5. Postgraduate programmes, short courses and facilitate workshops, seminars and internships, that will build capacity for technology innovation and improve technology-enhanced learning;
6. Increased access and subscription to STEM programmes in the university and the region for improved performance and applied research;
7. Established digital policies that ensure smart societies, digital governance and sustainable digital policy.
8. Partnerships and linkages with collaborating institutions in public and private sectors that increase digital literacy and enhance quality of STEM education

KEY CAPACITIES

ACETEL is committed to modelling global best practices in Open and Distance e-Learning (ODeL). The Centre utilises the affordances of digital technologies in the delivery of its programmes.

- Its programmes are offered online with highly interactive learning resources offered in a wide variety of multimedia formats.
- Students shall have access to physical and virtual libraries and laboratories.
- ACETEL has Faculty comprising seasoned academics from around the world and leading practitioners in the industries.
- ACETEL Faculty in collaboration with the public and private stakeholders designed and developed its programmes to provide relevant knowledge and competencies.

MAJOR ACCOMPLISHMENTS TO DATE

- Development of digitalized learner Centred interactive e- learning resources for postgraduate programmes in the following fields: Artificial Intelligence, Cyber Security and Management Information System
- Establishment of ACETEL- Cisco Networking Academy for skill based capacity building
- Virtual training workshop to 15 ICT University staff on the use of Adobe Captivate for digitalization of learning resources
- Capacity building for 20 ICT staff to become certified Cisco trainers
- Virtual capacity building for over 500 registered participants in the following IT skill based courses
 - Internate of Things (IOT)
 - IT Essentials
 - Get Connected

This is to address the gap of digital literacy in staff and postgraduate students



PRIMARY REGIONAL AND GLOBAL PARTNERS

The Centre has a strong partnership base with the following National and International Institutions and Industries.

1. Open University UK
2. University of West England
3. Kwame Nkrumah University, Ghana
4. South African Institute for Distance Education (SAIDE)
5. CISCO Nigeria
6. Softcom Nigeria,
7. Glo Nigeria Ltd
8. MTN Nigeria



PRIMARY RESEARCH FACULTY MEMBERS

1. **Prof. Christine Ofulue**
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Software Engineering
10. **Mr. Abubakar Bello**
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Hardware Engineering



Covenant Applied Informatics and Communication - Africa Centre of Excellence (CApIC-ACE)

University and Host Country:

Covenant University, Nigeria

Centre's Website:

<https://ace.covenantuniversity.edu.ng>

Centre Director:

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Centre Deputy Director:

Prof Emeka Iweala and Prof Emmanuel Adetiba

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Primary Thematic Disciplines of the Centre:

- The thematic disciplines of CApIC-ACE are Computer Science, Bioinformatics, Biochemistry and Electrical & Electronics Engineering.

BRIEF DESCRIPTION OF THE CENTRE

Covenant Applied Informatics and Communication Africa Centre of Excellence (CApIC-ACE) domiciled at Covenant University is one of the Centres selected to be funded by the World Bank for 2018 – 2022 ACE-IMPACT which was announced on November 13, 2018 at an elaborate meeting held at the National Universities Commission.

CApIC-ACE was established based on the need to build a critical mass of indigenous African scientists with the necessary bioinformatics, molecular biology, and information and communication engineering knowledge and skills to drive and sustain impactful researches in collaboration with academic, clinical and industrial institutions in Nigeria, West Africa, Africa, Germany, France, US and UK. Our collaborators have a track record of successful research, training and capacity building.

CApIC-ACE is built on the existing infrastructure and personnel as well as externally-funded research projects for malaria and FEDGEN (NIH H3ABioNet, NIH WASLITBre and German Science Foundation (aka DFG) being run by CUBRe) and cancer (CaPTC) at Covenant University. The Federated Genomic (FEDGEN) cloud infrastructure (with in-memory computing and cloud AI capabilities) is being design to process and analyze indigenous genomic data to address African health issues, including health education, medication efficiency and early disease diagnosis.

KEY OBJECTIVES AND EXPECTED RESULTS

Below are the 5 Specific Aims the Centre intend to achieve;

Research Project 1 (Malaria, Drug Development):

- Develop the first genome scale metabolic model for P.f in the host (RBC stages) and its Flux balance analysis (FBA) which will be expanded to a genome-scale regulatory-

metabolic model capable of simulating host and pathogen responses to different genetic and environmental perturbations.

Research Project 2 (Malaria, Drug Development)

- Develop virtual and/or high throughput screening and inhibitor design and synthesis against selected antimalarial sites from 1 above.

Research Project 3 (Malaria, Control Development)

- Develop virtual screening and inhibitor design against selected insecticidal sites outputted from a DFG funded project and experimentally validate in the lab these inhibitors against malaria infected A. gamb. compare to A. gamb. with no malaria infection.

Research Project 4 (Cancer: Prostate & Breast)

- Implement a genome wide association study (GWAS) to identify candidate genes that drive prostate and breast cancers that contribute to poor prognosis in Nigeria men and women. The identified genes will play a role in genetic biomarker risk determination and subsequent therapy.

Research Project 5 FEDGEN

- Expand on our existing High-Performance Computing (HPC) facility to implement a first version of an in-memory database computing platform to bring home genomic research to populations in Africa, customized to address specific issues of Health in Africa, namely health education, medication efficiency and enhancement of early disease diagnosis.

KEY CAPACITIES

Covenant University with student population of over 8,000 and academic and non-academic staff population of over 400 and 500 respectively;

- Biochemistry Department at Covenant University having 3 equipped with RT-PCR and conventional Polymerase chain reaction machines etc;
- A software Engineering laboratory at Covenant University with HPC to facilitate high speed computing for genomic data analysis;
- KNUST, Kumasi Ghana to serve as both training and research on modelling and computing site for Research Projects 1-4; and
- Lagos State University Teaching Hospital (LASUTH), Lagos Nigeria site to be used to facilitate sampling for Research Projects 1-4.

MAJOR ACCOMPLISHMENTS TO DATE

- Development of a functional website for the Centre.
- Advert and recruitment of 3 PhD and 6 Masters degree students with 2 of the Masters' degree students from the Region.
- Development of major policies such as Finance, Audit, Procurement, Scholarship, Sexual Harassment etc. for effective running of the Centre.
- Training of key Centre officials e.g. 3 people attended Project Management Training, 2 attended Finance & Audit training and 2 went for Communication & Admin training.
- Setting up of the Centre office and ICT laboratory.

PRIMARY REGIONAL PARTNERS

1. **KNUST**
 - Dr. P. Salifu
 - Dr. P. Amoako-Yirenkyi
 - Dr. B. Duduyemi
2. **USTTB**
 - Prof. S. Doumbia
 - A/Prof. M. Wele
3. **ULPGL**
 - Prof. C. Takenga
 - Prof. B. Mushage

PRIMARY GLOBAL PARTNERS

1. **Jena University Hospital, Germany**
 - Prof. Ralner Koenig
 - Dr. Marcus Oswald
 - Dr. Thomas Beder
2. **German Cancer Research Center (aka DKFZ), Heidelberg**
 - Prof. Benedikt Brors
 - Dr. Nikolas Gunkel
 - Dr. Aubry Miller
 - Dr. Karel Kilka
3. **Swiss Tropical Institute and Public Health Institute, Switzerland**
 - Prof. Till Voss
 - Prof. Pascal Maeser
 - Dr. Mercel Kaiser
4. **University of Florida, USA**
 - Prof. Folakemi T. Odedina
5. **University of Southern California, USA**
 - Prof. John Carpten

PRIMARY RESEARCH FACULTY MEMBERS

1. Professor Victor C. Osamor

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- Bioinformatics, Computational Biology, Healthcare informatics, Neuroinformatics, Data analytics, Data mining and Epigenetics. Others are Public health, Modeling and Network Reconstruction, Functional genomics, K-means Clustering, Microarray data analysis, Genome-Wide Association Studies (GWAS), Next Generation Sequencing, Bioinformatics tools application, Drug discovery, PCR, Proteomics and Drug design. Computer Graphics and Animation. Software development.

2. Professor Abiodun Adebayo

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- Biochemical, Phytochemical, and Toxicity Studies of Some Medicinal Plants commonly found in our locality. Clinical Biochemistry of Viral and cancer-related Diseases

3. Associate Professor, Solomon O. Rotimi

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- Genomics, Molecular Biology, and Clinical Biochemistry

4. Professor Olubanke O. Ogunlana

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- Antimalarial, cytotoxicity and biochemical toxicological investigations of extracts of leaves and stems of *Caesalpinia bonducella*. (PhD work);
- Pharmacological and toxicological investigation of some Nigerian medicinal plants;
- Studies on the antioxidant potentials of some tropical green leafy vegetables;
- Genomic and Proteomic evaluations of some medicinal plants in Nigeria;
- Structural characterization of some antiplasmodial potential drug target.

5. Associate Professor, Jelili O. Oyelade

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- Computational Molecular Biology, Cell Biology and Immunology
- Associate Professor, Grace I. Olasehinde
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- Molecular epidemiology of malaria; Antimalarial drug resistance; Antiplasmodial, antibacterial and antifungal activities of indigenous herbas/extracts
- Development of 'Point of Care' Diagnostic methods for malaria and Schistosomiasis

6. Professor, Olayinka O. Ajani

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- Organic Synthesis and Medicinal Chemistry

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- Biometrics & Biomedical Image Analysis, Machine Learning, Data Analytics, Software Engineering

8. Dr. Titilope M. Dokunmu

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- Oncology, genomics of Infectious diseases, neutraceuticals

9. Dr. Marion O. Adebiyi


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- Anti-malaria drugs resistance mechanism, insecticide resistance mechanism and in-silico analysis of organism's inter-pathways using the microarray and NGS data; Employing standard statistical and computational techniques in analyzing transcription profiling data or micro-array data of organisms, in-silico methods for NGS data; 3D protein structure and function prediction.

10. Dr. Itunuoluwa M. Isewon

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- Bioinformatics, Systems Biology, Artificial Intelligence



Africa Centre of Excellence for Sustainable Power and Energy Development (ACESPED)

University and Host Country:

University of Nigeria, Nsukka, Nigeria

Centre's Website:

www.acespedunn.edu.ng

Centre Director:

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Primary Thematic Disciplines of the Centre:

- Electric Power Systems Engineering
- Renewable Energy and Energy Conservation
- Energy Forecasting and Assessment
- Sustainable Energy Materials
- Energy Policy and Management

BRIEF DESCRIPTION OF THE CENTRE

ACESPED is a multi-disciplinary environment geared towards developing sustainable power and energy solutions for the West African region in general and Nigeria in particular.

Areas of activities include, electric power and high voltage systems, electro-mechanical and electro-chemical energy systems, smart, mini and micro-grid energy systems, computer-aided design/simulation and other engineering computational methods, energy resources assessment and forecasting, energy policy and management, environmental and social impact assessment of energy systems, sustainable energy materials and structures for power and energy systems, control and instrumentation, renewable energy systems based on hydro-power, agricultural and municipal wastes, wind energy, geothermal energy, photovoltaic and thermal solar energy systems, energy conservation and application of smart energy systems for modern living, among other areas of interest for modern power/energy engineering practice.

KEY OBJECTIVES AND EXPECTED RESULTS

The Africa Centre of Excellence for Sustainable Power and Energy Development (ACESPED), based in the main campus of the University of Nigeria Nsukka was conceptualized to proffer sustainable solutions to some development power and energy challenges peculiar to the Sub-Saharan Africa region. These challenges include lack of access to reliable electric power supply, poor diffusion of renewable and alternative energy technologies, as well as shortage of high level skilled manpower to deploy and manage the power supply system.

The fundamental aims of ACE-SPED are, therefore to carry out impactful educational, research, development and training activities in five major thematic areas, namely (i) Electric power systems development; (ii) Renewable energy and energy conservation; (iii) Energy resources assessment and forecasting;(iv)

Sustainable energy materials and (v) Energy Policy, Regulation and Management. Using a student-centred, interactive and engaging educational curriculum cum robust Research & Development themes with strong practice orientation, ACESPED plans to equip its Master's and PhD degree graduates to deliver great impact on sustainable power and energy development in the Sub-Saharan Africa region in the medium to long terms.

The Centre aims to train skilled manpower to boost electricity generation and distribution in the region (using conventional and renewable energy resources) to support national grids as well as the West Africa Power Pool (WAPP) The centre will mount short courses for personnel of management cadre in energy and power sector.

KEY CAPACITIES

Highly trained and motivated manpower, including academic partners in the fields of Power and Energy research

- Functional High Voltage laboratory with basic equipment
- Functional laboratory of Industrial electronics and New Energy Devices
- Strong industrial partners within 150km radius for students' internship (NCERD, Nsukka; EEDC, Enugu; SEDI, Enugu; PRODA, Enugu, Nigeria.
- Strong Institutional Support

MAJOR ACCOMPLISHMENTS TO DATE

- Preparation and approval of ACESPED Implementation Plan document
- Completion of Batch A 2019/2020 MEng screening examination and admission process
- Advertisement for Batch A 2019/2020 MEng and PhD admission process
- Installation of facilities for recording e-lectures and hosting of virtual meetings
- Drafting of MOU with other Energy and Power ACEs within the West-African region to form a regional network called West Africa Centres of Excellence for Energy Network (WACEENET)


PRIMARY REGIONAL AND GLOBAL PARTNERS

Enugu Electricity Distribution Company (EEDC), Enugu, Enugu State, Nigeria

1. Scientific Equipment Development Agency (SEDI), Enugu, Enugu State, Nigeria
2. Production Development Agency (PRODA), Enugu, Enugu State, Nigeria
3. Enugu Chamber of Commerce and Industry, Enugu, Enugu State, Nigeria
4. National Power Training Institute of Nigeria (NAPTIN), Abuja, Nigeria
5. National Centre for Energy Research and Development (NCERD), Nsukka
6. Mirai Denchi Inc, Kusatsu, Japan
7. Nigerian Chamber of Commerce and Industry in Japan (NCCIJ), Tokyo, Japan

PRIMARY RESEARCH FACULTY MEMBERS

- | | |
|--|--|
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Africa Centre of Excellence in Future Energies and Electrochemical Systems (ACE-FUELS)

University and Host Country:

Federal University of Technology Owerri, Nigeria.

Centre's Website:

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Centre Leader:

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Primary Thematic Disciplines of the Centre:

- STEM

BRIEF DESCRIPTION OF THE CENTRE

The Africa Centre of Excellence in Future Energies and Electrochemical Systems (ACE-FUELS) is established to fill a growing education, skills and information gap in the field of renewable and other clean energy sources within the sub region and in this way address the regional development challenge of poor availability and access to energy.

Indeed, there is really no shortage of energy in the sub region, which has an abundance of renewable energy resources (solar, wind, biomass, hydrothermal, clean hydrocarbon). What is lacking is the requisite skilled human resources as well as the technological, educational, physical and economic infrastructures for efficient and inexpensive exploitation of the available resources, to effectively navigate this challenging and complicated transition from the conventional to clean energies.

The Centre shall prioritize training, research and development, knowledge sharing and dissemination, community education, technical skills and capacity development, stakeholder engagement, industry partnerships, research translation and commercialization as its core functions. The Centre's functionality shall bear a national and regional outlook, which would ultimately facilitate development of local, national and regional capacities and competences.

KEY OBJECTIVES AND EXPECTED RESULTS

ACE-FUELS is envisaged to:

1. Develop a critical mass of well-trained researchers to meet requirement of Research and Development professionals for clean energy and related high technology applications.
2. Initiate and support high end research, to extend knowledge beyond the existing practice in the industry.

3. Promote local content in research and innovations by initiating necessary value-driven industry-academia collaborations.
4. Partner with local content industry initiatives within the region to help develop competencies by providing bespoke work-based learning events, activities and tools in line with global best practices.
5. To set up standard laboratories, with facilities for multi-disciplinary research projects based on electrochemical and energy related technologies.

KEY CAPACITIES

- Equipped office spaces
- Laboratories (Science and Language)
- Library
- E-classrooms
- Hostel accommodation

MAJOR ACCOMPLISHMENTS TO DATE

Approval of curricula for 4 novel MSc and PhD programmes Future Energies, Electrochemical Energy, Corrosion Technology and Nano Technology.

- Successful recruitment of MSc and PhD students from partner Departments for 2018/2019 academic session.
- Approval of ACE-FUELS Implementation Plan.
- Active participation of some members in workshops and seminars organized by World Bank and AAU
- Deployment of Oylex Learning Management System and faculty training

PRIMARY REGIONAL AND GLOBAL PARTNERS

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PRIMARY RESEARCH FACULTY MEMBERS

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Polymer Composites and blends; corrosion control



Regional Centre of Excellence for Electricity Control (CERME)

University and Host Country:

University of Lomé, TOGO

Centre's Website:

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Centre Director:

Professor Ayité Sénah Akoda AJAVON

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Centre Deputy Director:

Professor Kossi NAPO

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Primary Thematic Disciplines of the Centre:

Conventional and renewable electricity, more specifically:

- Production of electrical energy by:
- Thermal power station; Hydraulic power plant; Solar power plant (photovoltaic and thermodynamics); Wind power plant; Bioenergy; Accumulators; Energy transmission and distribution; Electrical machines; Power electronics; High Voltage Technology; Automatism; Energy efficiency; Advanced Materials for Electricity; Electricity and environment; Etc.

BRIEF DESCRIPTION OF THE CENTRE

The promotion of the power sector is among the priorities of African governments. In this regard, the Togolese State, on the one hand, adheres to the Sustainable Development Objectives (SDO) in general and SDO N°7 in particular, and on the other hand, adopts the law relating to Togo's energy policy which provides for ensuring access to energy for all Togolese by 2030.

Electricity is seen as a growth sector and its access by all and its availability in quantity and quality is an indicator of the development of any country.

To this end, the CERME, which is the result of cooperation between the Ecole Nationale Supérieure d'Ingénieurs (ENSI) and the Faculty of Sciences (FDS) of the University of Lomé (Togo), aims concretely to promote scientific excellence (research and development), excellence in teaching and training of students in Master Professional Engineer, Master Research Engineer, Master Research and Doctorate, in the training of short duration and à la carte in most specialties in the field of conventional and renewable electricity.

Similarly, CERME will provide advisory support to actors in the electricity sector (producers and distributors of conventional and renewable electrical energy, industries or companies consuming electrical energy, industries or companies manufacturing electrical equipment, industries/sectors or companies promoting or installing renewable energy, etc.) in Togo and West and Central Africa.

KEY CAPACITIES

- A building housing:
 - Several administrative premises o several classrooms and an auditorium with about 300 seats; o several laboratories of practical work and research;
 - Two rooms equipped for videoconferencing (distance learning courses)
 - A library equipped with several thousand books and with online subscriptions to magazines, newspapers and digital books.
- A thirty-two-seater bus for student transportation

KEY OBJECTIVES AND EXPECTED RESULTS

To achieve its objectives, CERME envisages several activities relating to training, research, capacity building, and the valorisation and popularisation of research results in the field of electricity (conventional and renewable) will be carried out. Within the framework of excellence in education and training, a regional Master and Master Engineer program is declined in three (03) courses. Numerous research projects through the work of doctoral theses will be carried out. Short-term training programmes will also be developed.

The results obtained by CERME will impact on the development of Togo and the sub-region at the plan:

- the reduction of the poverty rate through decentralized rural electrification and the extension and improvement of the public electricity network;
- an increase in the success rate in education and access to health services thanks to the extension and improvement of the electricity network;
- industrial development (facilitation of access to electricity with a reduction in the cost to industry);
- the increase in the number of PhD specialists, Master Engineers and Technicians trained in the field of electricity for the maintenance of electrical equipment, energy efficiency, etc.;
- The creation of electrical products and services that can have an impact on development on the one hand and contribute to the sustainability of the centre on the other.

MAJOR ACCOMPLISHMENTS TO DATE

- Setting up the project implementation team;
- Development of the Implementation Plan;
- Development of the student handbook;
- Development of the Financial Management Manual;
- Development of the Procurement Manual;
- Development of the Sexual Harassment Policy document;
- Development of the Scholarship Policy document;
- Formulation of LTD milestones 4.3 and 7.5;
- Implementation of the new training offers
- Recruitment of new master students and organization of courses;
- Recruitment of doctoral students and start of research activities;

PRIMARY REGIONAL AND GLOBAL PARTNERS

1. University of Abomey-Calavi (BENIN).
2. Ecole supérieure polytechnique (ESP) / Cheikh Anta Diop University (UCAD) of Dakar (SENEGAL).
3. Gaston Berger University of Saint-Louis (SENEGAL).
4. University of Thiès (SENEGAL)
5. Institut de Recherche sur les Energies Nouvelles / Université Nangui Abrogoua, Abidjan, (COTE D'IVOIRE).
6. Kwame Nkrumah University of Sciences and Technology (GHANA)
7. Ecole des Ingénieurs de Metz (ENIM)/ University of Lorraine, Metz, (FRANCE).
8. Auburn University (USA).
9. University of Cape Town (SOUTH AFRICA).
10. Université du Québec à Trois-Rivières (UQTR), Trois-Rivières, Québec, (CANADA).

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African Centre Of Excellence For Logistics And Transport (CEALT)

University and Host Country:

University Of Djibouti - Republic Of Djibouti

Centre's Website:

<http://www.univ.edu.dj/?p=1305>

Centre Leader:

Dr. Abdoukader IBRAHIM IDRIS

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Primary Thematic Disciplines of the Centre:

- The Centre specializes in the fields of Logistics and Transport and STEM through its Co-E component.

BRIEF DESCRIPTION OF THE CENTRE

The CEALT centre consists of 2 components CELT (Logistics and Transport) and Co-E (College of Engineering).

It is equipped with an infrastructure that meets international standards and welcomes motivated Master and Doctorate students selected through competitions among the Bachelor's degrees offered by the University of Djibouti.

KEY OBJECTIVES AND EXPECTED RESULTS

The CEALT centre aims to provide the Republic of Djibouti and the countries of the region with highly competent and innovative technicians, specialists, engineers and managers in the strategic sectors of African development, namely Logistics, Transport, Innovation and Entrepreneurship.

It also aims to provide engineering training in response to the real needs identified in the promising socio-economic sectors such as transport systems, electrical and energy engineering (EEE), civil engineering (GC), and data sciences (MDS).

The centre aims to raise the profile of research within the University of Djibouti through the production of high-level scientific research papers.

KEY CAPABILITIES

- A site with international standards
- A Smartclass
- A Fablab
- Two Laboratories of Electrical and Electronic Engineering and Civil Engineering
- Equipped computer rooms

MAIN ACHIEVEMENTS TO DATE

- Recruitment of the first class of 9 PhD students from the University of Djibouti
- Reinforcement of the Master's degree in Electrical and Electronic Engineering
- Reinforcement of the Master in Civil Engineering
- Reinforcement of the Master in Logistics and Transport
- Implementation of a Master's degree in Data Sciences since the start of the 2019 academic year.

MAIN REGIONAL AND GLOBAL PARTNERS

1. **Istanbul Technical University (ITU)**
Master GEE, GC+ Doctorat
2. **University of Paris 1 La Sorbonne**
Master in Logistics and Transport
3. **University of Clermont-Auvergne**
Master Data Sciences
4. **University of Tangier in Morocco**
Master Data Sciences
5. **Al Mohammadia University**
Master's degree in transport engineering
(Opening Soon)



PRIMARY RESEARCH FACULTY MEMBERS

- | | |
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| <p>5. Mr. Mohamed Youssouf
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Parasitology-Entomology</p> |



KNUST Engineering Education Project (KEEP)

University and Host Country:

Kwame Nkrumah University of Science and Technology (KNUST), Kumasi, Ghana

Centre's Website:

keep.knust.edu.gh

Centre Leader:

Prof. Kwabena Biritwum Nyarko

Deputy Centre Leader:

Dr. Jerry John Kponyo

E-mail Address:

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Primary Thematic Disciplines of the Centre:

- Engineering with a focus on Energy and Digital Development

BRIEF DESCRIPTION OF THE CENTRE

The Centre seeks to address the shortage of high-level skills and applied research in the area of Energy and Digital Development in Ghana and the sub-region.

The vision of KEEP is to contribute to Ghana and the sub-region's industrial and digital revolution through excellence in engineering education, research and innovation.

The Centre is focused on strengthening postgraduate education at the College of Engineering, conducting, and disseminating applied research focused on addressing development challenges related to industrialization, digital development and energy.

The quality of education will be improved through the provision of infrastructure (classrooms and equipment) to enhance learning and research environment, structured internship with industry, collaboration with other universities, innovation and startups development. Applied research will be enhanced through strong partnership with industry - contract research, industry funded research that addresses priority applied research questions that meets the need of industry.

KEY OBJECTIVES AND EXPECTED RESULTS

The key objectives are:

- Increase access to high quality postgraduate engineering education and research
- Conduct high quality applied research that meets the needs of the end users.
- Strengthen existing collaborations and establish new ones with Industry and academic partners for enhanced research and training
- Drive innovation in engineering through the establishment of an innovation challenge fund to support startups.
- Increase female enrollment in postgraduate education in engineering.

The expected outcomes include:

- Train at least 75 PhDs and 100 Masters students
- Improved applied research in engineering programmes
- Increased research uptake in priority sectors (energy and digital development)
- Increased number of highly skilled workforce to drive economic transformation
- 10 startups emerging from the College of Engineering innovation challenge

KEY CAPACITIES

- State-of-the-art laboratories for Energy (Petroleum Engineering, Chemical Engineering, Renewable Energy)
 - Laboratory analysis for the oil and gas sector
 - Energy audit
- Texas Instrument Cadence Laboratory for Microelectronic Circuits Research
- High Voltage and Power Systems Simulation Laboratory
- College Innovation & Incubation Centre
- Brew Hammond Energy Centre to support Energy Research

MAJOR ACCOMPLISHMENTS TO DATE

- The Centre has enrolled 37 PhDs and 81 MSc students
- Establishment of a functional Sectoral Advisory Board made up of key industry players in Energy and Digital Development.
- Establishment of four functional thematic research groups to drive research in Energy and Digital Development.
- Establishment of the Responsible AI Network (RAIN) Africa in collaboration with Technical University of Munich to support collaborative AI research in Africa.
- Successful development of a prototype ventilator to support the fight against COVID-19.

MAIN REGIONAL AND GLOBAL PARTNERS

1. Gambian Technical Training Institute
2. Norwegian University of Science & Technology
3. Technical University of Munich
4. Stellenbosch University
5. University of Johannesburg
6. IIT Madras
7. Manipal University, India

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