Pan African University
Institute of Water
and Energy Sciences

Call for Short-Term Lecturers

Year 2017-2018

advancing africa

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Call for Applications for Short-Term Lecturers

Pan African University PAUWES

The Pan African University (PAU) is a continental initiative of the African Union Commission (AUC) to develop higher education and research to practice in Africa. It is aiming to exemplify excellence, nurturing quality, enhance the attractiveness and global competitiveness of African higher education and research and establish an African University at the core of Africa's development.

The Pan African University (PAU) Institute of Water and Energy Sciences (including Climate Change) (PAUWES) is PAUWES is the fourth institute that is operational alongside the Institute of Governance, Humanities and Social Sciences (PAUGHSS) at the University of Yaounde II in Cameroon; the Institute of Basic Sciences, Technology and Innovation (PAUSTI) at Jomo Kenyatta University of Agriculture and Technology in Kenya; and the Institute of Life and Earth Sciences (PAULESI) at the University of Ibadan in Nigeria.

The Institute is supported by the AUC and German Cooperation, and is hosted by the University of Tlemcen, Algeria. This beautiful Mediterranean city befittingly derives its name from the Berber word for "water springs." In partnership with the Algerian and German governments, the PAUWES Institute offers graduate students access to leading academic teaching, research and hands-on training in areas vital to the future of African development – water, energy and the challenge of climate change.

Launched in 2014, PAUWES currently offers four full-time two-year master programs (120 credits) in English: two Masters of Sciences (MSc) in both Water and Energy Engineering and two Masters of Sciences (MSc) in both Water and Energy Policy. The two-year programmes are composed of three teaching semesters and one fourth semester to work on the master thesis and research internship or field trip linked to their thesis project. An increasing number of students do a second internship in the private or public sector between the two years of study.

First activities supporting entrepreneurship and career entry of students have been launched, the research agenda is being developed and first PAUWES PhD students are enrolled in a collaborative doctoral programme between the University of Tlemcen, a consortium of German universities and PAUWES. The Institute has also successfully entered into several international partnerships with academia and the private in Africa.

Since the inception of the institute in 2014, a total of 152 students from 25 countries across Africa have enrolled in the four master programs. The third cohort will start in October 2018. To complement our international faculty, we are now seeking to fill a number of short-term positions at an adequate academic and professional level of teaching and

Short-Term Positions

1. Teaching

To complement our international faculty, we are seeking to fill a number of short-term positions at the lecturer level. We are looking for faculty who will bring a student-centred, interactive learning style to the classroom and uses techniques such case studies, simulations, group works and peer learning ensuring engagement, knowledge production and strong practice orientation. Experience with promoting gender equality and diversity in the classroom is an asset.

2. Tasks and Responsibilities

In addition to teaching, all short-term position holders will also be required to:

- Write a detailed syllabus including the didactical approach (interactive learning) and practice's relevance;
- Set and mark examinations in accordance with the Institute regulations and guidelines;
- Be available to interact with students also during breaks;
- Coordinate lab experiments with lab-lecturers from University of Tlemcen;
- Share all information regarding the course with those lecturers.

All practical works will be carried out by lecturers from the University of Tlemcen, the host of PAUWES.

3. Open Positions

The courses require between 20 and 70 contact hours, lasting between 3 days and 2 weeks depending on the subject.

3.1. Master of Science in Energy

Position E1: African Energy Resources and Scenarios (one course)

This course is an introduction providing an overview of the energy resources in Africa, with a particular emphasis on renewable energy. The key issues that will be covered include: the available energy resources in the different parts of the continent, the current levels of exploitation, and future / planned developments; technical, social, economic, and cultural challenges (if any) in the development of energy from the different resources. The course will allow the students to identify the available energy resources in Africa, and how these can be utilised to deal with energy challenges such as energy access particularly for poor countries in the continent, energy insecurity, and reliance on conventional energy. This course aims to impart knowledge and understanding of Africa's energy resources as well as how to undertake and interpret energy policy formulation so as to ensure sustainable use of these resources. The course also introduces the linkages between energy production, energy use and climate change. It pays special attention to the role of energy use in respect of climate change mitigation and adaptation efforts.

→One 4-credit course, 45 contact hours, to be taught in Energy, Engineering Track and Policy Track, 1st semester

Position E2: Introduction to Energy (one course)

This course aims to provide students the knowledge and skills to utilise basic scientific and engineering principles to analyse the fundamentals of energy sources and systems. Topics include an overview on energy supply and demand systems, life cycle analysis, energy efficiency, and the environmental consequences of various sources such as global climate change in the 21st century. The course discusses energy sources and usage, sustainability tools for energy systems analysis, economics of energy systems, conventional energies (fossil fuels, peak oil Issues, combustion systems, climate change, carbon sequestration, nuclear and energy politics) and renewable energy strategies.

→One max. 2-credit course, 25 contact hours, to be taught in Energy, Engineering Track and Policy Track, 1st semester

Position E3: Energy for Sustainable Development (one course)

This course includes a review of energy resources (oil, coal, LPG, natural gas, nuclear, solar, wind, hydro, ocean thermal, tidal, geothermal, biofuels, biogas), their distribution in Africa, developed and undeveloped potentials, African development pattern associated with energy resource distribution, conventional energies and sustainable development (economic and environmental implications), new alternative energies and sustainable development (economic and environmental implications), technical and economic limitations in the use of various energy technologies (conventional and renewable) , socio-cultural issues in energy resource developments and applications, reliability of supply, centralised and decentralised power generation systems (operational costs, advantages and disadvantages), energy storage and transport issues, technological infrastructure.

→ one 4-credit course, 45 contact hours, to be taught in Energy, Engineering Track and Policy Track, 1st semester

Position E4: Renewable Energy Technologies (one course)

This course provides an introductory overview of the whole variety of renewable technologies. Renewable resources techniques assessment and renewable energy exploitation technologies are considered in a general manner. The course introduces the following topics: Solar resources evaluation techniques, technology of photovoltaic cells and modules, technology of photovoltaic systems, low temperature solar technology, high temperature solar technology, wind resources evaluation techniques, WECS technology, wind system technology, geothermal resources and geothermal energy conversion technology, hydropower resources and technology, biomass conversion technologies, wave and tidal technologies, biogas, solar hydrogen.

→one 3-credit course, 3 contact hours, to be taught in Energy, Engineering Track, 1st semester

Position E5: Energy Efficiency & Demand Side Management (one course)

This course discusses energy efficiency, demand response, and the institutional options for delivery of energy efficiency in Africa. The module examines different demand side management / energy efficiency measures that can reduce energy demand for the end user, that can manage and control loads from the utility side. Challenges for implementing energy efficiency and demand side management programs will also be examined in residential, commercial, industrial and transport sectors.

→ one 3-credit course, 30 contact hours, to be taught in Energy, Engineering Track and Policy Track, 3rd semester

Position E6: Thermal Science and Engineering Applications (one course)

This course covers the fundamentals of thermodynamics as applied to energy systems. First, the course provides a review of the basic concepts of thermodynamics, the first and the second law of thermodynamics and the notion of irreversibility. Then the course studies the fundamentals of chemical reactions and combustion processes. Topics on ideal and real gases as well as on steam production and thermodynamic properties of steam are covered. State-of the-art in the thermodynamic cycles will be presented in an interdisciplinary perspective. Among the thermodynamic cycles considered, there are Carnot cycle, Otto cycle, Diesel cycle, Atkinson cycle, Ericson cycle and Brayton cycle as well as Rankin cycle. Regenerative cycle, reheat cycle and binary cycle are also considered. Topics on gas power cycles and steam power cycle are covered. Finally, the internal combustion engine topic is addressed and the two-stroke cycle engine and the four-stroke cycle engine are covered.

→one 2-credit course, 25 contact hours, to be taught in Energy, Engineering Track, 2nd semester

Position E7: Technical Performance Assessment (one course)

The course provides the conceptual and analytical approaches and tools for assessing how well the technology performs as promised. These includes: statistical analysis, Bayesian confidence profile analysis, surveys / questionnaire, trial use periods, s-curve analysis, Beta testing, human factor analysis, outcomes research and technometrics.

→one 2-credit course, 22 contact hours, to be taught in Energy, Engineering Track, 3rd semester

Position E8: Instrumentation (one course)

This course aims to provide the students with the tools for proper experimental design and experimental measurement techniques for data collection, treatment and analysis. It is also meant to provide the know-how for testing techniques and failure diagnostic. It covers primarily measurement fundamentals, sensors and transducers, techniques for signal conditioning, analog /digital conversions, PC-interfacing (Hardware, Software), PC configurations and hardware for data acquisition, data storage and compression techniques, processing and data analysis techniques as well as commercial data acquisition products.

→one 3-credit course, 30 contact hours, to be taught in Energy, Engineering Track, 3rd semester

Position E9: Hybrid Systems (one course)

This course aims at introducing the student to energy generation using hybrid systems. The course covers first the basics and the technology of the most commonly used energy generation components of hybrid systems. This course aims at introducing the student to energy generation using hybrid systems. The course covers first the basics and the technology of the most commonly used energy generation components of the hybrid systems. Focus is on the hydrocarbon-renewable energy sources hybrid systems and on different renewable energy sources hybrid systems. The course addresses also the issue of hybrid system design, sizing and performance estimation in relation to the expressed needs and to the availability of the different energy resources. It includes also the study of the effect of the interconnection possibilities between the different energy generation components. The course deals also with the economics of hybrid systems. A significant part of the course is dedicated to case studies addressing African preoccupations.

→one 4-credit course, 45 contact hours, to be taught in Energy, Engineering Track, 3rd semester

Position E10: Externalities / Impact Analysis (one course)

This course introduces students to two economic tools which are of particular importance in implementing and evaluating technical solutions: externalities and impact analysis. For externalities, the course will introduce the notion of unintended consequences of intended action / decision and apply it to technical projects in energy. In addition, it will cover impact analysis as a specific tool to anticipate, model, and evaluate the economic effects of energy projects based on input-output models (e.g. IMPLAN or EMSI) or economic simulation models (such as e.g. REMI).

→one 4-credit course, 45 contact hours, to be taught in Energy, Engineering Track and Policy Track, 2nd semester

Position E11: Solar Photovoltaic Energy (one course)

This course aims at introducing the student to solar photovoltaic energy. It covers the nature of solar radiation, solar fusion processes, solar radiation spectrum, direct and diffuse radiation, photon energy, solar constant, photovoltaic energy materials (band structure of solids, semiconductors, energy band gap and photon energy ranges), material properties suitable for PV production, production of semiconductor junctions for solar cell applications, processing of PV grade materials (purification and doping), controlled crystal growth for solar cell application; current-voltage characteristics of solar cells, encapsulation techniques, solar panels and modules; solar PV systems design, solar cell efficiencies and fill factors, as well as solar cell manufacturing processes.

→one 4-credit course, 45 contact hours, to be taught in Energy, Engineering Track, 3rd semester

Position E12: Solar Thermal Energy (one course)

This course aims at introducing the student to solar energy. It covers the nature of Solar Radiation, solar radiation spectrum, solar constant, air-mass numbers, modes of heat transfer, solar thermal conversion techniques, surface absorption properties, absorption of direct and diffuse sunlight by surfaces, spectral absorption properties, thermal conversion materials and selective surfaces, design of solar thermal devices: Flat plate collectors, focusing collectors, solar cooling and heating, solar air heaters, water heaters, different types of CSPs, heat losses and their calculations, effects of wind on solar thermal converters, Heat storage systems, solar drying and solar desalination.

→one 4-credit course, 45 contact hours, to be taught in Energy, Engineering Track, 3rd semester

Position E13: Hydro & Maritime Energy one course)

This course includes a review of fluid dynamics and mechanics, water-based energy systems (ocean thermal, tidal, wave, hydro, cogeneration systems); conversion techniques of each of these into other forms of energy; hydro: water reservoir, conveyer pipe, pressure head, effects of pipe friction, types of turbines, number and sizes of nozzles, jets, small and large hydro systems; capacity assessment and systems design, mechanical-to-electrical power coupling, determinations of: required turbine angular velocity, wheel size, cup size, shape factor, power transmission, losses as well as hydropower production design and management.

→one 4-credit course, 45 contact hours, to be taught in Energy, Engineering Track, 3rd semester

Position E14: Wind Energy (one course)

This course provides deep a understanding of the basic principles of fluid dynamics/mechanics, linear momentum theory, wind kinetic energy, aerodynamic shapes, (different types of turbines (horizontal and vertical axis turbines), wind turbine design factors (interference /perturbation factors, power coefficient, force coefficient, torque coefficient, dynamic matching), efficiencies and speed control systems, high speed low torque machines, low speed high torque machines (electricity generation and water pumping wind turbines), mechanical-to-electrical coupling. Energy storage.

→one 4-credit course, 45 contact hours, to be taught in Energy, Engineering Track, 3rd semester

Position E15: Bio-Energy (one course)

This course covers the identification and characterization of raw materials for biofuels, biofuel development and food security, natural product extraction and purification methods, chemical structures and properties of different biofuels (ethanol, biodiesel, etc.), bioenergy crops, liquid biofuels, bioenergy production by anaerobic digestion, gasification process, Charcoal production techniques, heat and electricity generation from agricultural biomass wastes.

→one 4-credit course, 45 contact hours, to be taught in Energy, Engineering Track, 3rd semester

Position E16: Geothermal Energy (one course)

Major composition of the earth, the earth's layers, occurrence of hot aquifer, temperature gradient, useful energy content of aquifer, geothermal energy potential assessment, time constant.

Electricity generation, environmental impact and mitigation. Power generation systems: Dry Steam Power Plants, Flash Steam Power Plants, Binary Cycle Power Plants.

→one 4-credit course, 45 contact hours, to be taught in Energy, Engineering Track, 3rd semester

Position E17: Energy Conversion and Storage (one course)

The aim of this course is to provide the students a broad view of the different sources of energy, the different techniques of energy conversion and storage as well as to introduce the power electronics used in energy conversion and control. It will include the following main topics : Energy natural resources, Energy conversion technologies: thermo-chemical, electrochemical, photo-electric, thermomechanical. Power electronics, Energy storage techniques: thermal, electrical, mechanical, electromechanical and Chemical.

→one 4-credit course, 45 contact hours, to be taught in Energy, Engineering Track, 2nd semester

Position E18: Energy Economics, Finances & management (one course)

This course aims to impart knowledge and skills for undertaking economic and financial assessment of renewable energy projects as well as an understanding of the fundamentals of financing and the financial disciplines appropriate for running these projects. This will include the discussion of sources and financing mechanisms for renewable energy projects including various green initiatives. The course will also cover preparation of bankable projects, corporate finance as well as capital market operation. The candidate should be a leading expert in Energy Economics, Finance and Management and have a PhD or equivalent in a related subject.

→one 6-credit course, 68 contact hours, to be taught in Energy, Engineering Track, 2nd semester

Position E19: Material Science (one course)

The course covers a wide variety of topics on material science and engineering. In the first part, the fundamentals of material science, material processing, thermodynamics and kinetics of materials are introduced. Then the properties of materials used in energy are reviewed. This includes polymers, ceramics and semi-conductors. Topics in degradation and failure are addressed.

In the second part, the course explores energy material. Special emphasis is put on solar material and more particularly solar photovoltaic material. Among the subjects covered, there are solar photovoltaic and solar cell fundamentals, solar cells and PV module manufacturing technologies, cells and modules efficiencies and characterization. Topics on polymer, advanced inorganic material, hydrides, porous materials and low dimensional solids are also included in the course.

→one 2-credit course, 23 contact hours, to be taught in Energy, Engineering Track, 2nd semester

Position E20: Research Methods for Energy Engineering (one course)

This course provides an introduction to research methods. It imparts knowledge on how to design research questions and hypotheses. It also teaches basic skills in qualitative and quantitative methods, data collection and analysis, design and structure of experiments. It provides knowledge on research strategies and new generation of instruments and tools for experimentation specific to energy engineering.

It imparts knowledge on reporting of research findings including ethical considerations and the validation of results. Innovation, patenting, and technological transfer are also discussed.

→one 3-credit course, 30 contact hours, to be taught in Energy, Engineering Track, 2nd semester

Position E21: Policy Analysis for Energy (one course)

The purpose of the Energy Policy Analysis course is to provide an overview of methods of policy analysis applied to the field of energy policy in Africa. Students should be enabled to design meaningful policy options as well as to analyze the specific context in which policy decisions are being made. The course will thus emphasize the "politics"-dimension of policy-making and enable students to give advice and act in different political contexts. Teaching should draw on cases and examples of African energy policy-making in Africa and students should be enabled to take on different roles as advisors to different actors in policy making contexts – be it on the side of state institutions (ministries, state energy agencies) or on the side of industry, non-governmental organizations active in the field, or think tanks and research institutions.

→one 4-credit course, 45 contact hours, to be taught in Energy, Engineering Track, 2nd semester

Position E22: Energy Modelling and Simulation for Policy Analysis (one course)

This course has three major components: (1) Students are to learn how to describe the components, dynamics and applications of a system (causal feedback loops and their effects, system behavior, and real-world
applications for systems) (2) Students will learn how to analyze the behavior of models (examples of equilibrium, homeostasis, and oscillation; model different types of model behavior, and the influence of delay on a system). (3) Students will design and build a dynamic model of a system (define the purpose and key variables, determine information flows, quantify the flows, determine methods of quantifying soft variables, compare model results to real world knowledge of the system, and refine the model by incorporating additional, relevant information).

→one 3-credit course, 30 contact hours, to be taught in Energy, Engineering Track, 2nd semester

Position E23: Renewable Energy Policy and Planning (one course)

The course provides an overview of the key issues within renewable energy policies, including drivers of the energy market, market structures and concepts, international climate policies, main stakeholders, interests and strategies. The course will particularly examine political frameworks and support mechanisms for introduction of renewable energy technologies into the local market. It will review experiences with different voluntary and regulative support mechanisms and draw lessons from these experiences.

→one 2-credit course, 25 contact hours, to be taught in Energy, Engineering Track, 2nd semester

Position E24: Development of Renewable Energy Systems (Grid) (one courses)

The course provides an overview on regulatory, legal and contractual aspects in RE-projects. It provides understanding of the economics of renewable energy projects (specific value creation chains, finance market conditions, project calculation scenarios, input parameters, comparative calculation and financing schemes). The objective of this module is that students know and understand important non-technical aspects for the successful implementation of RE-projects. The course gives an insight into RE-specific legal and contractual aspects and enables students to perform an economic analysis of typical RE businesses and projects. Students will learn about economics of RE-systems, possible funding schemes and will develop their strategies for RE-market development.

→one 2-credit course, 25 contact hours, to be taught in Energy, Engineering Track, 2nd semester

Position E25: Development of Renewable Energy Systems (non-Grid) (one course)

This module provides measures and information on how to successfully implement RES in areas and regions with no connection to the electricity network. Regarding social aspects, it gives measures to ensure public acceptance, which is important to guarantee useful application of energy and proper Operation & Maintenance.

The module has a special focus on multi-user systems and explains business opportunities through RES. In terms of financing, the module provides an overview of common financing schemes and explains different property models of RES. Financing is a very important aspect of the curriculum as the initial investment is often the main barrier for the implementation of RES. The module also explains the definition and implementation of standards as well as policies at regional and national level. Regarding incentives, the efficiency as well as advantages and disadvantages of different funding and tax models are analyzed. This section also provides the tools to implement and monitor measures with the aim of foster non-grid RES as well as to encourage private investment and possibly to establish a local manufacturing industry.

→one 2-credit course, 25 contact hours, to be taught in Energy, Engineering Track, 2nd semester

Position E26: Urban Energy Supply (one course)

This course delivers and overview on grid-connected RE-technologies which generate electricity in urban areas or supply electricity to urban areas and on RE-technologies generating heat. Through a blended mix of instructor-led training and hands-on workshops, students will get a comprehensive overview of the main commercially-viable renewable technologies, and come to understand how they work and how systems are designed. In the second part the course covers economic assessment (investment costs, life-cycle costs and revenues) and financing of different technologies. At the end of this course students will be able to assess the appropriateness of different technologies for different situations and to undertake their own initial designs for renewable energy systems.

→one 2-credit course, 25 contact hours, to be taught in Energy, Engineering Track, 2nd semester

Position E27: Rural Energy Supply (one course)

The course covers RE-technologies used for off-grid applications and will cover stand-alone solutions as well as hybrid-systems consisting of different RE-technologies or in combination with diesel-generators or with storage systems. Students will learn about the technologies, hybrid systems and micro-grids. After focusing on the technologies, system design and case studies non-technical aspects like market development, regional trends and economics will be in the focus. Lectures are supplemented by demonstrations and practical exercises in the training center.

→one 2-credit course, 25 contact hours, to be taught in Energy, Engineering Track, 2nd semester

Position E28: Ethics and Leadership (one course)

In this course, the students will enhance their capacity to analyze and evaluate the ethical positions and assumptions of different parties involved in sustainability disputes. The course shall include an overview of sustainability ethics but also introduce theories of identity-building, change and leadership (group dynamics, alternative narratives, networks). Case studies should be presented.

→one 4-credit course, 45 contact hours, to be taught in Energy, Engineering Track, 2nd semester

3.2. Master of Science in Water

Position W1: African Water Resources and Scenarios (one course)

The course presents a survey of the water resources of Africa, covering surface and groundwater. Their hydrological characteristics are summarized as well as the range of their uses. The variety allocation of water resources to the various uses is shown and the cases of multi-functionality and conflicting uses are demonstrated. The status of sustainability is evaluated. The existing visions, policy goals and plans for African water resources are illustrated on a continental, river basin and national scale. The tools of scenario development are analysed for expected climate change effects as well as for socio-economic changes and their applicability to African water resources is demonstrated. Their usefulness as tool for anticipating emerging issues in water resources planning is shown.

→one 2-credit course, 23 contact hours, to be taught in Water, Engineering Track and Policy Track, 1st semester

Position W2: Introduction to Integrated Water Resource Management (one course)

This course provides an introduction to the fundamental concepts and practice of Integrated
Water Resource Management, skills and knowledge required to understand and manage water resources. It introduces students to the technical, economic, social and environmental complexities of water resources management so that they will be able to appreciate the importance of IWRM approach for sustainable development. It will provide students with context and a view of water use and management by presenting some examples of integrated water resource plans already implemented in various parts of Africa. The general principles of IWRM will be visualised as three interlocking and interdependent areas: the hydrologic cycle, watershed and land-use features and the economics, social interactions and institutions involved. There are external impacts such as global climate change, water transfer between watersheds and others.

→one 2-credit course, 23 contact hours, to be taught in Water, Engineering Track and Policy Track, 1st semester

Position W3: Water Quality (one course)

The first of this course part covers general concepts of the problems related to organic and inorganic substances of natural or anthropogenic origin in aquatic systems such as lakes, rivers, dams, oceans, groundwater, drinking and wastewater. The basics of thermodynamics, acid-base, precipitation-dissolution, co-ordination and oxidation-reduction reactions are provided which are necessary to understand the environmental behaviour of such compounds. The second part of the course covers general concepts of environmental microbiology with the specific focus on aquatic systems including quantification of microbial processes, energy fluxes in microbial ecosystems, microbial diversity and nutrient cycles. The focus of the second part will be on key waterborne pathogens, their transmission, life cycle, survival and growth in natural environment, drinking and wastewater systems and disease burden. The third part of the course is organized as a laboratory practicum which demonstrates important analytical methods gives insights in application of state-of-the-art microbiological tools.

→one 2-credit course, 23 contact hours, to be taught in Water, Engineering Track and Policy Track, 1st semester

Position W4: Hydrology (one course)

This course introduces hydrologic cycle, system concept, hydrologic system model, hydrologic model classification and the development of hydrology. It then moves on to watershed morphometry (definition, study of form, study of stream networks, relief study), atmospheric water (atmospheric circulation, precipitation, rainfall, evaporation and evapotranspiration, climate study), subsurface and surface water (unsaturated flow, infiltration, sources of stream flow, stream flow hydrograph), hydrologic measurement (measurements of surface water, hydrological measurement system) and finally hydrologic analysis (hydrologic statistics and frequency analysis, modelling in hydrology).

→one 2-credit course, 23 contact hours, to be taught in Water, Engineering Track and Policy Track, 1st and 3rd semesters

Position W5: Water Economics (one course)

The course confers knowledge about the economic principles and economic tools applicable to water policy issues pertaining to water resource issues prevalent in African countries, the determinants of water demand and water supply projects for storage and bulk conveyance.
Students will be qualified to apply the economic tools to specific problems in the African context, to derive policy proposals to solve water resource related problems, to assess existing policy proposals and to assess the quality of related scientific research and assess research gaps. Furthermore students will be qualified to judge the problems and the perspectives for the improvement of the status of national water policies and projects in African countries in order to perform well as water professionals on the national level, in international organizations and as consultants.
→one 4-credit course, 45 contact hours, to be taught in Water, Engineering Track and Policy Track, 3rd semester

Position W6: Geographical Information Systems (one course)

At the end of the course, the student will be able to design a GIS application, to understand how multi sources data is structured in a GIS software, to know the potential analysis that can be done in various situations to produce useful information to support decision making in planning, monitoring and management of resources (water, forests, soil, lands) and infrastructures (drinking-water systems, a network of roads and tracks,...), to choose the type of GIS software to operate according to its needs, be aware of the problems associated with the information flow and the reliability of data used in a GIS for the success of its operations. The course will cover modelling geographical space (systemic approach), the methodology for developing a Data Conceptual Model (DCM), numeric modelling in GIS (topologic and non-topologic system), acquisition digital, Digital Elevation Model (DEM), Quality of data.
→one 2-credit course, 23 contact hours, to be taught in Water, Engineering Track and Policy Track, 3rd semester

Position W7: Physical Instrumentation and Measurement (one course)

The goals of the course are to make better measurements, understand the physical principals of the parameters, to use those measurements in any research project to better evaluate their use and their spatial variability, and to make better use of them in the evaluation, planification or in the management of water. The course covers the physical principles of measurement, principal parameters (measurement of water level, flow rate, speed of water, sedimentation and conductivity of water), the chains of measurement (automatic) and the equipment for manual measurement.
→one 2-credit course, 23 contact hours, to be taught in Water, Engineering Track, 3rd semester

Position W8: Applied Numerical Analysis and Modelling (one course)

This course will provide students with an understanding of the basic concepts, computer implementation and water models. It should impart the basic skills needed to use the finite element method to solve numerical problems. It will thus cover finite and element difference methods as well as finite volume methods (Godunov scheme summary; Minmod limiter, flux limiting function formulation, Hartens's sufficient conditions for numerical method to be TVD, extension to systems of linear PDE's, extension to nonlinear PDE's, mat lab implementation; two dimensional advection; groundwater modelling by finite element method). At the same time it should guide the student in developing a critical eye for computational matters; and practical skills in applying methods to predict applied situations.
→one 2-credit course, 23 contact hours, to be taught in Water, Engineering Track, 3rd semester

Position W9: Fluid Mechanics (one course)

This course should allow students to understand the various theories of fluid mechanics. Aside from basic concepts (characteristics and properties of fluids, compressibility, viscosity, surface tension, basic characteristics of fluid flow and fluid statics) it will thus cover topics such as laminar unidirectional flow, fundamentals of turbulent flows, hydrodynamic lubrication, the flow of an ideal fluid as well as flow with a free surface.

→one 2-credit course, 23 contact hours, to be taught in Water, Engineering Track, 1st semester

Position W10: Fundamentals of Water Science and Engineering (one course)

The course is designed to give students an understanding of the basic concepts in fluid mechanics, water chemistry and water microbiology. It will thus cover fundamental concepts of fluid flow (fluid statics, dynamics of fluid flow, laminar and turbulent flows, pipe flow systems); water chemistry (elements, radicals, and compounds, chemical water analysis, hydrogen ion concentration and pH, chemical equilibria, chemical kinetics, colloids and coagulation, organic compounds, organic matter in wastewater) and water microbiology (bacteria, fungi, viruses and algae, protozoa and multi-cellular animals, aquatic food chain, waterborne diseases, coliform bacteria as indicator organisms).

→one 2-credit course, 23 contact hours, to be taught in Water, Policy Track, 1st semester

Position W11: Water for Agriculture: Irrigation Techniques and Drainage & Irrigation Project Design (two courses)

Course 1: The goal of the first course is to provide students with the knowledge and skills required to assess, plan and design agricultural surface and sub-surface drainage works. At the completion of the course the students should be able to understand crop water needs; manage soil moisture to promote desired crop response; evaluate irrigation; optimize the use of available water supplies; minimize irrigation induced erosion; decrease non-point source pollution of surface and groundwater resources; manage salts in the crop root zone; choose the appropriate and effective techniques of irrigation to the crop; understand tile drainage design; design, test, and analyse agricultural irrigation systems and their components (gravity irrigation, sprinkler irrigation, trickle irrigation).

Course 2: Collection and analysis of climatic, soil and crop data. Determination of crop water requirements and gross irrigation requirements; Choice of the optimal cropping pattern based on different simulation scenarios (limited water availability, use of saline water, etc.) and economic criteria. Determination of specific continuous discharge; Hydraulic design of a large scale distribution network; Cost/Benefit analysis. Environmental Impact Assessment Applications; Synthesis, conclusions and reporting

→two 2- credit courses, 23 contact hours each, to be taught in Water, Engineering Track and Policy Track, 3rd semester

Position W12: River Basin Management 1: Management of Extremes (Droughts and Flooding) (one course)

The course confers knowledge about the challenges for management of transboundary water resources, the legislative framework for management of transboundary water resources (International water law, regional protocols, agreements and treaties, principles for allocating transboundary water resources), the institutional arrangements for integrated management of transboundary water resources (types and functions of transboundary river basin organizations, stakeholder participation at national and transboundary levels), the planning methods (transboundary diagnostic analysis, strategic action planning), practices of integrated management of transboundary river basins, lakes, and transboundary aquifers. Case studies of past and current approaches used for transboundary water resources management in Africa will be presented.

→two 2- credit courses, 23 contact hours each, to be taught in Water, Engineering Track and Policy Track, 3rd semester

Position W13: River Basin Management 2: Management of Transboundary Water Resources (one course)

The course confers knowledge about the challenges for management of transboundary water resources, the legislative framework for management of transboundary water resources (International water law, regional protocols, agreements and treaties, principles for allocating transboundary water resources), the institutional arrangements for integrated management of transboundary water resources (types and functions of transboundary river basin organizations, stakeholder participation at national and transboundary levels), the planning methods (transboundary diagnostic analysis,

strategic action planning), practices of integrated management of transboundary river basins, lakes, and transboundary aquifers. Case studies of past and current approaches used for transboundary water resources management in Africa will be presented.

→two 2- credit courses, 23 contact hours each, to be taught in Water, Engineering Track and Policy Track, 3rd semester

Position W14: Soil conservation (one course)

The course confers knowledge about the issues facing soil erosion and sedimentation, their determinants and modelling as well as the land use and technical options to control and the socio-economic factors influencing soil erosion and sedimentation. It will also draw implications for the nutrient and carbon processes in soil and water. The students will learn to derive proposals to solve problems related to soil and water conservation and to assess existing policies.

→two 2- credit courses, 23 contact hours each, to be taught in Water, Engineering Track and Policy Track, 3rd semester

Position W15: Hydrogeology (one course)

This course is aimed at providing the student with a comprehensive introduction to the most important topics in groundwater hydrogeology. This course will prepare students to analyze ground-water flow processes taking into account aquifer properties, basic hydraulic factors, geologic controls, and their temporal and spatial interactions. Mastery of concepts relies on quantitative analysis.

→two 2- credit courses, 23 contact hours each, to be taught in Water, Engineering Track and Policy Track, 2nd semester

Position W16: Hydraulics (one course)

The course is designed to give the students a solid understanding of hydraulics (open channel hydraulics and flows under pressure), particularly in steady, gradually varied flow, and a basis for the design of free surface systems. After attending this course, a student will be able to describe the various types of flows in open channels, the velocity distribution across and along the channel and hydraulic jumps. The technical lecture (flows under pressure) uses modelling: concepts and methods of computational assisted design are widely used in the projects.

→two 2- credit courses, 23 contact hours each, to be taught in Water, Engineering Track and Policy Track, 2nd semester

Position W17: Research Methods for Water engineering (one course)

This course provides an introduction to research methods. It imparts knowledge on how to design research questions and hypotheses. It also teaches basic skills in qualitative and quantitative methods, data collection and analysis, design and structure of experiments. It provides knowledge on research strategies and the generation of instruments and tools for experimentation specific to water engineering. It imparts knowledge on reporting of research findings including ethical considerations and the validation of results. Innovation, patenting, and technological transfer are also discussed.

→two 2- credit courses, 25 contact hours each, to be taught in Water, Engineering Track and Policy Track, 2nd semester

Position W18: Policy Analysis for Water Resources Management (one course)

The course confers knowledge about water resource management as a topic of policy analysis and the applicability of the tools of policy analysis to public decision-making in water resource management. It focuses on the actors involved in water policy making and their interests in the various aspects of water use, on the role of governments (and their various layers and organizations) in managing water resources and the instruments at their disposal (water rights, water use restrictions, water resource planning, economic incentives) and on the decision-making procedures and processes in water policy making (parliamentary and ministerial decision-making, delegation to public authorities, public-private cooperation, public participation).

Students should be qualified (1) to analyze water policy options with respect to the effect on water use, its economic and social implications, and (2) to analyze specific water policy decisions, reflections the interests of policy actors.

→two 2- credit courses, 23 contact hours each, to be taught in Water, Engineering Track and Policy Track, 2nd semester

Position W19: Databases, Indicators and Statistical Analysis (one course)

The course familiarizes students with available databases, especially with respect to ecological concerns, and introduces them to the general requirements associated with data collection. Students will also acquire knowledge about social science

research design, explore various methods of qualitative and quantitative data analysis (descriptive, inductive, inferential statistics), learn about the most common mistakes, and they will acquire basic knowledge in the use of statistical software (SPSS or STATA).Beyond those common objects of statistical data analysis students will learn about specific aspects of water related statistical research like trend detection and statistical methods in water resources.

→two 2-credit courses, 25 contact hours each, to be taught in Water, Engineering Track and Policy Track, 2nd semester

Position W20: Sanitation and Water Treatment (one course)

The course qualifies students to understand the global and African situation with regard to the issues of excreta, wastewater, and solid waste disposal and comprehend the connection between these processes and health, resource conservation and environmental protection. In addition, it enables students to understand the global and African situation with regard to the issues of water resources and drinking water and its relation to health, resource conservation and environmental protection and to know scientific, technical and engineering principles of drinking water abstraction, distribution and use and factors affecting their efficiency, costs, sustainability and acceptability.

→two 4- credit courses, 45 contact hours each, to be taught in Water, Engineering Track and Policy Track, 2nd semester

Position W21: Law and Policy of Water Quality and Sanitation (one course)

The course introduces the world water situation using examples and indicators. The situation in Africa will be addressed based on the existing African water policy and law, its challenges, weak and strong appearances.

The course is working out the general solution approach for good water governance: “Sustainability” and “Integrated Water Resource Management (IWRM)”.

→two 2- credit courses, 23 contact hours each, to be taught in Water, Policy Track, 3rd semester

Position W22: Water Quality and Sanitation 1: Water Quality and Environmental Health (one course)

The course objective is to understand the emissions and transport pathways of point and diffuse pollution from urban areas, agriculture and geogenic sources into the aquatic environment. Furthermore, transport, retention and degradation processes within the receiving water bodies will be introduced. Students will learn to view water bodies (for example: river basins) as integrated systems and how to analyse, quantify and evaluate the sources of pollution as a basis for the planning of mitigation measures. Students will be able to choose the right treatment technology for a given sanitation problem.

→two 2- credit courses, 23 contact hours each, to be taught in Water, Engineering Track and Policy Track, 3rd semester.

Position W23: Law and Policy of Water for Agriculture (one course)

At the end of this course the student should be able to properly examine institutional, economic and legal aspects of the use of water in agriculture. Special emphasis will be devoted to the analysis of policies dealing with irrigation: Water rights for agriculture, costs and financing of irrigation investments, role and set up of water user organizations, management of drainage operations.

The course includes the following:

Principles of farm economics; extension to include irrigation agriculture; water allocation in irrigation sector (Principles of economic and environmental planning at farm and regional scale; Basic principles of mathematical programming: choice of optimization functions; Utilization of modeling approaches]: general principles and examples of applications; Cost/Benefit analysis; Basics on Economic valuation of environmental goods; Land law and water rights; Cost recovery mechanism; degree of agricultural subsidies, Political economy of subsidies, Participatory Irrigation Management approaches; Planning and implementation of irrigation management transfer; Restructuring the irrigation agency and building new capacity; Development of water user associations; Water pricing and cost recovery mechanisms; Environmental impact assessment.

→two 2- credit courses, 23 contact hours each, to be taught in Water, Policy Track, 3rd semester.

3.3. Common Courses for both Master's Programs

Position C1: Introduction to Policy Analysis (one course)

The course will give an overview over the different moments of the policy cycle and their respective challenges. It will introduce the basic concepts, methods, and controlling tools (hierarchical means, financial incentives, provision of information, marketing and influencing strategies, target control) of public policies and will critically reflect general limitations, unintended consequences and possible unwanted outcomes (like harmful externalities) of a public policy. Attention will also be devoted to aspects and tools for evaluating public policies and their impact on further policies.

→max. 2-credit course, 23 contact hours, to be taught in Energy, Policy track and Water, Policy Track, 1st semester

Position C2: African History (one course)

This course aims at providing the history of Africa in the wider context of the world history. It examines the evolution and development of African states and societies, the cultural systems, the social and political structures, the development of technology and agriculture as well as broad changes and continuities in Africa's historical development. The course will also illustrate how Africans have influenced regions beyond their continent's borders, how they have been influenced from the outside.

→one 4-credit course, 45 contact hours, to be taught in Energy, Engineering & Policy track and Water, Engineering & Policy Track, 1st semester

Position C4: Academic Writing (one course)

The course will focus on the connections between research process, academic writing and the structure of academic texts. Students will also be introduced to grammar and style for academic purposes with a particular focus on technical subjects and the problem of communicating technical subjects in an understandable manner (to a non-expert audience). Special attention will also be given to issues of clarity, logic and coherence. Finally, the course will cover citation techniques, references and the issue of plagiarism.

→one 2-credit course, 23 contact hours, to be taught in Energy, Engineering & Policy track and Water, Engineering & Policy Track, 1st semester

Position C5: Entre- and Intrapreneurship (one course)

This course seeks to enhance students' entrepreneurial/ intrapreneurial mind-sets, skills and behaviour – with or without a commercial objective. Students should learn to identify, explore and promote business opportunities or opportunities for development/advancement as independent actors or embedded in institutions in the public, private or civil society sector. They are to confront practical business challenges and opportunities in the private sector and challenges for development in the public and civil society sector, conduct a market and needs analysis as well as competitor and stakeholder mapping for business / project ideas and draft a first business / project plan presenting milestones and risks.

→one 2-credit course, 23 contact hours, to be taught in Energy, Engineering & Policy tracks, and Water, Engineering & Policy tracks, 3rd semester

Position C6: Communication, marketing and Networking (one course)

Introduction to networking. Why network. Types of networks: social, professional and business networks, use of social media and ICT. Sources of contacts for networking. Face-to-face and electronic networking, donor supported and self-sustaining networks, voluntary, membership and profit-making networks. Typical weaknesses and strengths, dos and don'ts, managing expectations, sustainability, institutional issues in networking.

→one 3-credit course, 30 contact hours, to be taught in Energy, Engineering & Policy track and Water, Engineering & Policy Track, 2nd semester

Position C7: Human Rights and Gender (one course)

This course considers the ways that human rights frameworks have been applied to issues of gender, particularly in Africa, through the emergence of Women's Human Rights. It provides the political movements and legal and policy arguments that helped formulation of Women's Human Rights, starting with feminist criticism of the gender bias in human rights frameworks

→one 4-credit course, 45 contact hours, to be taught in Energy, Engineering & Policy track and Water, Engineering & Policy Track, 2nd semester

Position C8: Methods for Policy Research (one course)

The course provides an introduction to research methods for policy research. It conveys an understanding of the various decisions and steps involved in crafting (and executing) a research methodology, as well as a critically informed assessment of published research. Students successfully completing the course will be able to understand research terminology and assess published research, to develop research questions that are based on and build upon a critical appraisal of existing research and policy applications, to identify the types of methods best suited for investigating different types of problems and questions, to design a research proposal, to implement a research proposal, to present research results for a policy audience.

→one 2-credit course, 23 contact hours, to be taught in Energy, Engineering & Policy track and Water, Engineering & Policy Track, 2nd semester

Position C9: Policy Influencing and Conflict Management (one course)

The course provides an introduction to the general theoretical framework (policy arenas, multi-level games, advocacy coalitions, policy processes) and give tools for situation analysis prior to any intervention in a given policy arena. The different modes of advocacy will be discussed, including the role of social media. The students will gain an understanding of the complexity of policy interventions as well as insights into different types of conflicts. The course will also present different methods of conflict resolution and present the qualities needed to negotiate successfully in a complex policy setting.

→one 4-credit course, 45 contact hours, to be taught in Energy, Engineering & Policy track and Water, Engineering & Policy Track, 3rd semester

4. Required Qualifications and Experiences

Mandatory requirements for all short-term positions:

- PhD or at least an MA-degree and 5 years work experience in public, private or third sector.
- Excellent English language proficiency (C1 level)

Additional criteria are:

- Research project or consultancy expertise;
- Experience in industry, private sector or public sector;
- Academic and professional networks;
- Teaching experience with knowledge of interactive learning;
- International experience;
- Commitment to supporting the institutional and program development;
- Experience with promoting gender equality and diversity in the classroom is an asset;
- Knowledge of French would be an advantage.

5. Remuneration

Courses are paid as per contact hours (one credit = 10 contact hours) plus a subsistence allowance. Additionally, housing is provided free of charge; health insurance, visa cost and travel expenses are covered according to PAUWES guidelines.

Contact hours of courses	Honorarium/hour (USD)*	Subsistence allowance/day (USD)
20 to 60	80	40

(*) before taxes

6. Starting Date and Duration of Contracts

Appointment: During the first semester of the academic year 2017/18 (earliest October 2017).

Duration of short-term positions: between two to four weeks depending on workload (credits/contact hours) allocated, see above. The first semester runs from October 1, 2017 through Mid-February, 2018. The second semester runs from Mid-February 2018 to the end of June, 2018.

7. How to Apply

Applications for academic staff positions should be sent to The Pan African University (PAU) Institute of Water and Energy Sciences (including Climate Change) at jobsatpauwes@gmail.com

Please submit (all documents as pdf format):

- Application letter:
  - Stating your motivation
  - Explaining your didactical approach ensuring insuring active learning and practice orientation
  - Current curriculum vitae
  - Making clear reference to advertised position (*)
  - Indicating availability between October 2017 and June 2018 (flexibility is an asset)

(*): please, submit as many applications as positions you are interested in.

- Updated curriculum vitae:
  - Personal details
  - Education
  - Professional experience
  - Teaching experience (courses taught, level of courses) and didactical approach
  - Number and themes of supervised Master and PhD students
  - Proficiency of languages
  - List of publications (major publications of last 5 years, books, patents)
  - Research projects
  - Consultancy projects and other assignments
  - Prizes, grants, awards etc.
  - Contact details of three referees

Closing date for applications: August 21, 2017 at 24:00 hrs GMT

8. Further Information

For more details on the PAUWES Institute, study programs and job opportunities, please see http://pauwes.univ-tlemcen.dz and https://pau-au.net/en/home

Pan African University
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