

## **DUKEENGAGE IN UGANDA-EWH**

Improving health care by repairing medical equipment in Uganda. This program is organized by Engineering World Health (EWH) in collaboration with DukeEngage.

**Dates:** June 2-July 28, 2019

(Dates subject to change up until the point of departure.)

### **Service Themes**

- Engineering
- Health/human services
- Technology/media

### **Program Focus**

Improving healthcare and facilitating the transfer of healthcare technology to regional hospitals through medical equipment repair and needs-based design. *Note: A similar program is taking place in Tanzania.*

Curricular Connections: While all students are welcome to apply, this program may be of particular interest to students studying biomedical engineering, as well as other STEM majors. (See below for additional details about connecting this program to your academic work.)

### **Program Leaders**

Dr. Robert Ssekitoleko, BME lecturer at Makerere University. Dr. Robert moved to the UK when he was a teenager, then earned his Bachelor's and Master's degrees in Medical Engineering from Queen Mary College at the University of London, and a Doctor of Engineering in Biomedical Engineering from the University of Strathclyde in Glasgow, Scotland. Afterwards, he moved back home and has been working tirelessly to elevate the field of BME in Uganda. He is now the Acting Head of the Program in Biomedical Engineering at Makerere University in Kampala.

Dr. Elizabeth Bucholz, Assistant Professor of the Practice in the Department of Biomedical Engineering at Duke University. She is the Faculty Fellow for DukeEngage Uganda-EWH.

### **Program Overview**

Students will learn about healthcare technology shortcomings in the developing world and spend time directly intervening to address these challenges. Students begin by receiving four weeks of training. They will study the public healthcare system in Uganda; receive lectures and hands-on lab training in medical equipment repair and maintenance; hear lectures and participate in workshops on needs-based design in the developing world; and study local language and culture (including Lugandan language, which is spoken around Kampala in addition to English). During the next four weeks, students will work in groups of three or four at one of our decentralized partner hospitals in Uganda repairing medical equipment, training the staff in the proper use of equipment, and conducting extensive interviews on healthcare technology needs. Students will be required to keep a daily log throughout the program and write a technical report before they leave Uganda, identifying a hospital-based need and designing a solution. Ugandan biomedical engineering students from Makerere University will participate in this program alongside the Duke students. Based on this past summer's feedback, updates have been made to how training is conducted during the first month and new hospital placements will be used.

Program schedule:

- Four weeks dedicated to medical instrumentation preparation, group visits to local hospitals, and group discussions about healthcare technology needs in Uganda
- Four weeks working at a local hospital outside Kampala
- A one-day end-of-program meeting to debrief and present on experiences and the design reports

### **Student Learning Objectives/Outcomes**

By the end of the course, students will improve in the following area:

#### **CRITICAL THINKING & TECHNICAL TROUBLESHOOTING**

- identify problems with electrical and mechanical devices and how the end-user interacts with them
- troubleshoot to uncover the root cause of a problem
- generate creative solutions to a problem, even in a low-resource environment
- prevent future problems by addressing the root-cause

#### **TECHNICAL KNOWLEDGE & SKILLS**

- identify various medical devices, their physiological purpose, how they work, how they commonly fail, and how to repair and test them
- solder and de-solder wires and circuit board components (outside of ideal classroom conditions)
- identify electrical and mechanical components, how they work, and how to test them
- identify various tools important to technical repair work

#### **CROSS-CULTURAL UNDERSTANDING**

- listen to others to understand their values and how they affect their decisions and actions
- train others in a supportive, respectful manner
- understand constraints and promises of the Ugandan healthcare system
- work closely with Ugandan students and hospital colleagues

#### **ACADEMIC DEVELOPMENT AND EDUCATIONAL SUCCESS**

- understand how engineered devices are used, maintained, and repaired in real-life, non-ideal conditions
- apply theoretical concepts from the classroom to hands-on implementation
- predict, and design to avoid, design failures common to the developing world
- appreciate the value of training local staff in the medical and technical fields

### **Partnership Opportunities**

The primary project of EWH's Summer Institute (SI) takes place during month two when participants do daily work in the hospital repairing, installing, and training local staff on medical equipment in resource-poor hospitals. During previous SI programs, students have repaired equipment ranging from autoclaves to ultrasound machines, water purifiers to anesthesia devices. Students have also conducted training classes for hospital maintenance staff and created manuals and inventories for staff.

Students will work in hospitals outside Kampala, Uganda. Our hospital partners vary in size and in capacity to repair and maintain medical equipment. Some of our partner hospitals, even those with a technical staff, cannot keep enough medical equipment in working order to perform basic medical procedures. Recent students in the Duke-EWH Tanzania and Uganda Summer Institute programs were able to put over 654 pieces, about \$1.3 million worth, of medical equipment back into service in 23 hospitals. They made a huge contribution, but the need in these hospitals is still great.

### **Program Requirements**

**Application Process:** In addition to the DukeEngage application, students applying for this program must download and submit the EWH application available at <http://www.ewh.org/apply>. ***You must submit this application directly to EWH by the DukeEngage application deadline, Nov. 1, 2018.*** Applicants must also submit the DukeEngage application by that deadline. It is advised to review the EWH application packet before completing either application, as the essay questions asked by EWH may be applicable to the DukeEngage ones.

Language Requirements: English is the lingua franca in Uganda although Luganda is the most widely spoken language around Kampala. There is no language requirement, but there will be an introduction to Luganda language.

Course requirements: Applicants must have at least two semesters of physics and two semesters of calculus by May 2019. AP credit can be used for one physics and one calculus only.

#### Personal Qualities:

- Interest in cross-cultural collaboration – excited about learning and working with Ugandan BME students and working with local hospital staff. Students encounter new foods, perspectives, pace of work, and style of living.
- Flexibility – adapts to changes in plan or environment, makes the best of environmental discomforts and basic living situations, learns and adapts to different cultural norms.
- Problem solving, creativity, and goal orientations – possesses strong analytical skills and an interest in producing deliverable end-projects. In addition to equipment repair, students are expected to complete a design proposal to address a need in the Ugandan healthcare system.

#### Curricular Connections

BME 290: Medical Equipment in Developing World

BME 590.04: Transcontinental Design in Uganda

BME195: Medical Instrumentation in the Developing World

BME 230L: Global Women's Health Technologies

BME 462: Design for the Developing World (offered Spring 2019)

DHT Lab Fellows: <http://dhtlab.pratt.duke.edu/>

Duke Global Health Institute (DGHI): <https://globalhealth.duke.edu/>

Duke Center for Global Women's Health Technologies (GWHT): <https://gwht.pratt.duke.edu/>

#### Program Details

Community Description: Students will live in the Makerere University compound at the Edge House Guesthouse in Kampala for the first four weeks of the program. They will then move in teams of 3-4 to guesthouses located close to placement hospitals. Kampala is a large, bustling urban city, but some placement sites will be in districts just outside the city. It will be dry season in Uganda, with a mild-to-warm climate and occasional downpours.

Housing and Meals: Students will be housed together in the Makerere University Edge House guesthouse for the first month and will be housed close to placement hospitals in teams of 3-4 during the second month. Rooms may be shared with other students of the same gender. Each student will have their own bed and mosquito net. Electricity is intermittent; outages are common, but there is electricity available to charge devices, etc. The guesthouses have running water, small hot water heaters, and modern western-style toilets. Running water may be intermittent with containers to store water during outages. Students will have facilities to hand-wash their own laundry.

During the first month, breakfast is provided. The guesthouse has a kitchen, the campus has a cafeteria, and there are nearby restaurants. During the second month, students will be responsible for purchasing and preparing all of their food. Funds will be provided to cover missing meals.

If you do not eat certain types of food for cultural, religious, or personal reasons, please contact the DukeEngage office, [dukeengage@duke.edu](mailto:dukeengage@duke.edu), to discuss whether or not your dietary needs can be reasonably accommodated at this program site.

Transportation: DukeEngage provides transportation to and from service placements and all scheduled program activities. Private van transportation is arranged for group hospital visits. To get around town, students may walk or use public mini-buses.

Communication: Students will be provided with a basic local cell phone for program-related and emergency communication. Free Wi-Fi and wired connections are available at the Makerere campus though not in the guesthouses. Internet cafes are also available.

Local Safety and Security; Cultural Norms, Mores and Practices: As part of their planning, DukeEngage strongly advises all prospective applicants to familiarize themselves with the common challenges travelers encounter at this program site in order to make an informed application decision that is right for them. We recommend starting with these two resources:

- the International SOS (ISOS) portal for up-to-the-minute travel, health and security advice ([Log in to the Duke ISOS portal](#) with your Duke NetID)
- the [Diversity, Identity and Global Travel](#) section of the DukeEngage website.

Opportunities for Reflection: Your site coordinator will lead regular reflection sessions in which you'll be expected to participate. More details will be shared with students once they arrive on site.

Other Opportunities: During the first month, all participants, including the Ugandan BME students from Makerere University, interact with each other daily. During the second month, participants work mainly with their hospital groups (3 to 4 people) and hospital staff aside from weekends or when their site coordinator visits. Students will have free time during the week when they are neither in class nor working at the hospital and almost all weekends to pursue social activities of their choice or have some downtime. Students are encouraged to spend evenings studying or interacting with their Ugandan classmates or with hospital staff. Open water swimming is not a sponsored activity in any DukeEngage program.

#### **More Information**

- *Lonely Planet: Uganda (Country Guide)*
- *Kicking Away the Ladder: Development Strategy in Historical Perspective* by Ha-Joon Chang
- *Mountains Beyond Mountains: The Quest of Dr. Paul Farmer, a Man Who Would Cure the World* by Tracy Kidder
- *Dead Aid: Why Aid Is Not Working and How There Is a Better Way for Africa* by Dambisa Moyo
- Bakwatanisa et al. Biomaterials use in Mulago National Referral Hospital in Kampala, Uganda: Access and affordability. *J Biomed Mater Res A*. 2016; 104(1):104-12.