

Amalthea Trust Kyambogo University Project

Week 1 (3rd – 9th October 2011)

Arrival

Visiting engineer, Satish Thaker, and I arrived at Entebbe airport at approximately 8am local time. Apart from the flight being delayed by approximately 1 hour, the journey went without any issues. During the flight, I met a friend of Satish, David, who also works at Colchester Hospital. He was travelling to Kampala to teach vascular imaging at Mengo Hospital ó from a clinical perspective, rather than an engineering one. I'm in talks with him about arranging a visit to Mengo Hospital to have a look at their facilities and engineering training courses.

When we arrived at the accommodation, our rooms were ready and John travelled to meet us.

Accommodation

As we discovered during our trip in September, the accommodation is basic but more than suitable for up to 8 weeks for teaching. The accommodation includes breakfast, but again, this is basic. Coffee, tea, and lunch / evening meals can be purchased at any time for about 4000USX (about 90p). Laundry service is also available at a small charge of around 5000USX, which includes washing and ironing. There is a large shopping complex about 5 minutes from the accommodation in a taxi, which costs 1000USX (USX means Ugandan Shillings).

The only issue with the accommodation is the lack of self-catering and facilities to make tea and coffee and light snacks. David introduced us to a local who is looking to rent out a 3 bedroom flat for around \$600 a month. Further communications will continue in order to look into this possibility (or something similar).

On several evenings, the power supply has been down in the guest house ó though the lights have been working fine - but this is a general problem in Kampala, not just the guest house.

Student Training

We started the student training on Monday morning after Satish had been shown around the department and I examined the progress of the work that was to be carried out after our last visit. All work had been carried out to a high standard and was safe for training.

The training started with an introduction from me and Satish, and then a small introduction from each of the students. From a class of 19, there were 3 females; one of whom, Rachel, was the class representative. During this first day, I explained what was going to be taught during this semester, and then spent about 1 hour discovering what they had and had not covered in the first year of the course. At the end of the first day, I had a very clear understanding of what they didn't know or understand about electronics.

After we had finished, Satish and I were shown around the rest of the university and met senior staff in the Faculty of Engineering. We decided to spend 3 days a week at the university ó Monday, Tuesday, Wednesday ó and 2 days at Mulago Hospital ó Thursday, Friday.

On Tuesday morning, I taught basic electronics, including:

- Basic electrical components: their construction and use in DC circuits
- The components covered were resistors, capacitors, inductors, diodes, LEDs, thyristors, and zenor diodes
- Connecting resistors, capacitors, and inductors in parallel and series
- Basic power calculations

On Tuesday afternoon, we went into the lab and introduced the electrical equipment that we brought down during the September visit ó mainly the power supplies and multi-meters. The students were very keen to get the practical experience in using this equipment and we made sure that every student had a chance to use the equipment themselves. We also performed some simple lab experiments using the electronic components that Satish brought with him. Again, the students were very keen on these practical experiments, so we will be doing as much practical work as possible during the semester.

On Wednesday morning I taught AC circuit theory. Most of the students didn't seem to know any AC theory so we spent a long time making sure they understood the basics for each section. In the morning we covered:

- AC signals, time-period, frequency, and peak-to-peak voltage
- Calculations of RMS voltage (without going into integration of sine-wave)
- How the electrical components covered the previous day react in AC circuits and why
- Apparent power, actual power, and reactive power. This meant covering impedance and reactance without going into imaginary numbers.

During this morning's sessions, the students noticed that I had made a small error in one of my calculations on the board. This was very good because until then the students had been too shy and ÷polite to say that the teacher had got something wrong. We were very happy, explained what it was that I had got wrong, and then reinforced the idea that if we ó or anyone else in a higher authority position ó get something wrong, it is good to politely let them know so that they can put it right.

On Wednesday afternoon, I quickly went over transformers and bridge rectifiers till about 3pm. After this, John, Satish, and I went to Mulago Hospital to meet with Edward, Head of Engineering at the hospital, and the Head Sister. During this time we agreed that all of the students will go to the hospital on Thursdays and Fridays from 9am to 3pm, working in the Main Theatre workshops. Due to infection control we have to change into theatre clothing for the whole time we are in the theatre. We cannot leave for lunch as we would have to put on new theatre clothing on the way back; for 20 students, this would put too much extra work on the theatre therefore we have a small lunch of about 10 minutes and the hospital provides tea and something small to eat.

On Thursday we went to the hospital, mainly to get the students used to the environment in which they will be working. We showed the students around the theatre workshops but didn't take them into the theatres as they were in use. For the engineers' use, we have 2 workshops which are full of equipment, and one large room, which used to be a common room but it now just full of equipment. The staff cleaned out the common room and we are now able to use this room for teaching and fixing equipment.

We didn't bring any electrical equipment to the hospital as we wanted to get a better idea of what we

needed to bring. There was a limit to what could be done without the test equipment but we got the students to go through most of the smaller equipment, categorising it into those items that would switch on and those that wouldn't. We also got them to work through the large number of leads and cables that were lying around in the workshops. Lots of the leads were American, and so we have started to make a collection of small equipment and leads which are of no use and will be disposed of, clearing up a lot of room. The students were discharged after lunch.

John, Satish, and I then went to a workshop for something called 'Living Labs'. This seems to be a charitable organisation looking at ways of helping individuals set up Small and Medium Enterprises within their own country. It is something that I will look into further as they were interested in a possible collaboration with the Amalthea Trust to set up better means of countries donating equipment, thereby reducing the amount of unnecessary equipment being sent over as 'junk'. They were also very interested in the fact that we are 'training future trainers'.

Transport to and from the hospital for everyone including the students, is via taxi which comes to about £25 a week in transport. This is currently being funded by the Amalthea Trust, but John and I are looking at trying to find funding to purchase a van as this will reduce the costs in the long run.

On Friday morning, we went to Mulago Hospital again. This time we met up at the university first to pick up some electrical equipment for performing some simple tests on the power supplies and the equipment. We took:

- 1 x Rigil safety tester
- 2 x hand-held multi-meters
- 1 x constant power-supply
- 1 x soldering iron and gun
- Assortment of cables for testing equipment

We found that there were plenty of screwdrivers in the workshop.

During the morning, we split the students into two groups. Satish's group went through some of the equipment, seeing if anything could be easily fixed. They looked at the surgery lights and found that they were probably working but simply needed some new bulbs. We are going to try and get some bulbs for Thursday's visit to try and fix or modify the lights so they can be used. My group were taught how to use the Rigil safety tester. I first showed them how to perform safety tests on the power supply and then got them to do the same set of tests themselves. I then went over how to perform this set of safety tests on some smaller pieces of medical equipment, where it was safe to do so without potentially damaging it. Again, I got the students to perform the tests themselves. As some of the students took a bit longer to fully understand the tests, I spent most of the morning going over it with smaller groups. In the end I think most of them understood the tests and all could perform them.

During the morning, one of the theatre staff came to the workshop saying that one of the anaesthetic machines wasn't working while a patient was under general-anaesthetic. Satish and myself went into the theatre room to examine the issue. It quickly became clear that the problem was probably with the power supply. We took away the step-down transformer as the anaesthetic trolley was American, requiring 110V instead of the supplied 220V, and split the students into two groups. One group finished fixing a step-down transformer which they had started fixing earlier in the day and got that one off to the staff within about 10 minutes. The other group went through a basic set of trouble-shooting steps to find the problem, which was then fixed and the equipment tested. As the

staff already had a working transformer, it was decided that the other fixed transformer would be kept in the workshop as a "spare". This was so we could start to gather a list of working equipment which the staff could use when theirs is broken, rather than the current system where all of the working equipment is being used and the staff have nothing as a backup.

In the afternoon, we looked at the equipment that was tested on Thursday and wouldn't switch on. It became clear that a lot of the equipment was not working because of a blown fuse. Unfortunately, there were no spare fuses in the workshop, so we couldn't try replacing them. We are looking into purchasing some fuse wire of different ratings to keep in the workshop to teach the students how to make appropriate fuses for when they can't get hold of any.

What became very clear during the Friday visit to the hospital was that the students were very keen on fixing the equipment but they were so keen that they were neglecting a lot of safety practices. For example, when a fuse was shown to be blown, we heard a couple of students saying something like, "just replace it with a piece of wire". We then spent a while explaining why this should not be done and made sure they didn't put that idea into practice on any of the equipment. We are therefore going to spend more time next week going into electrical safety and safe maintenance practices.