Projecting successful engineering

Final-year students of the Department of Electrical, Electronic and Computer Engineering recently competed against each other at the department's annual project evening.

This project evening is the result of a year's work, in which these students are required to complete an engineering design project (covering some 640 hours). Typically, 10% of the students are nominated to participate in the department's project competition. They are quizzed about the content of their projects and a panel of judges then selects a winner from those nominated.

"We want the students to showcase what they have done and we believe this introduces them to the kind of environment they will be in when they work in industry," says Prof Johan Hanekom, project professor from the department.

Prof Hanekom says there are about 180 final-year project students and some of the best projects are selected for presentation at the public forum. He says the projects cover topics such as bioengineering, computer network and security, control systems and automation, electromagnetism, electronics and microelectronics, energy systems, power systems, photonics, pattern recognition, power electronics and electric drives, signal processing and telecommunications, and software engineering, projects that consider reducing noise sources and projects that investigate alternative energy sources. "There are two types of projects: the first are research projects (which are not necessarily commercially viable right now) and the second are projects that come up with designs that are available right now and that are potentially viable," says Prof Hanekom.

The winner receives R1 500 in cash and a spot on a design course valued at R6 500. There are also two category winners – one for the project with a software emphasis and the other for the project with a hardware emphasis. "This is very prestigious for the students. I think students get a lot of mileage from participating in a competition like this and it makes them marketable. If a student goes for an interview and says he was one of the finalists, it makes him or her more marketable, especially if they come out on top," Prof Hanekom explains.

Data compression

Francois Luus walked away with the first place in the software emphasis category for his project on fountain codes for universal data compression. "My project is about creating a noise-robust data compression system that can replace conventional compression systems. This allows one to compress data in a high speed wireless network, which is not possible with conventional data compressors," he says.

He explains that he created a new way in which to do noise-robust data compression, which is universal, meaning that one can put any data into the system and it can be compressed. "It's very applicable when you have a hardware implementation in high-speed wireless networks to replace commercial compressors. Similar things have been done before – but I've created a compressor that has a higher noise-robustness and better compression than existing systems but I built on the existing work," he says.

Mr Luus says winning the competition means a great deal to him because it recognises the long hours and hard work he put in over several months researching his project.

Infant monitor

The winner of the hardware emphasis category of the project evening was Marnus Weststrate who developed a non-invasive infant monitoring system with apnoea alarm. "The problem with babies, especially premature infants, is that sometimes a dysfunction in their central regulation system occurs and they stop breathing – they apparently forget to breathe. This obviously causes a lack of oxygen and, if not detected, can cause the infant to die," explains Mr Weststrate.

His design detects any changes in an infant's heart rate that may signal that the baby has stopped breathing and then sends an alarm signal to indicate that such an occurrence has taken place. "The design concept interested me the most – it's an elaborate design incorporating a lot of different functional modules that had to be implemented and it addresses a real problem in the community," he says. Initial tests are very promising, although the machine has not yet been tested on babies. Yet, he says, the sensors detect differences in the heart rate of adults and this should easily be replicated when an infant is attached to the non-invasive machine.

"Winning the award is an awesome reward for the hard work I've put in and it's really a pat on the back for me," he says.

Prof Wilhelm Leuschner, the Head of the Department of Electrical, Electronic

and Computer Engineering, says the project competition benefits the students in that they get to measure themselves against other students. "We have been running this competition for many years and the quality is definitely improving dramatically. What's encouraging, from a departmental point of view, is that many students who are not final-year students yet, come and look at the final-year presentations and this is very inspirational for them. I think this is a lesson in life and that's the whole purpose. This is a real engineering project. You take it right from the start and you finish the project, it's got to work and you have to present it to a very critical audience. If you come out on top, you win the prize – which is very satisfying for students and staff," says Prof Leuschner.

→ The 2007 final-year project evening of the Department of Electrical, Electronic and Computer Engineering was a great success. The winners and runners-up of the various projects were (front row from left): Rina Mostert (runner-up in the hardware category with a project to design a microwave bandpass filter with additional transmission zeros – study leader: Prof Jan Malherbe), Marnus Weststrate (winner in the hardware category with a project to design a non-invasive infant monitoring system with apnoea alarm – supervisor: Prof Tania Hanekom) and Prof Wilhelm Leuschner (Head of the Department of Electrical, Electronic and Computer Engineering); and (back row from left): Francois Luus (winner in the software category with a project to design fountain codes for universal data compression – supervisor: Dr Sunil Maharaj), Charles Malleson (runner-up in the hardware category with a project to design and manufacture a noise reduction device for audiological testing – supervisor: Prof Johan Hanekom) and Mr Saurabh Sinha (competition organiser).