



A focus on EEC engineering at the University of Pretoria

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The Department of Electrical, Electronic and Computer (EEC) Engineering at the University of Pretoria is one of the largest departments of its kind in the southern hemisphere. Some 1 500 students are enrolled in various courses and the department contributes 25% of the professional engineers in South Africa. With a strong teaching focus and particular emphasis on high-quality technological development, applications and management, a significant contribution is made to the growth of the South African economy.

All academic programmes of the department are accredited by the Engineering Council of South Africa (ECSA). ECSA, in turn, is a signatory to the Washington Accord, which implies that all degree programmes accredited by ECSA are recognised by co-signatories to the accord. Co-signatories to date include countries like Australia, New Zealand, Japan, the United Kingdom, Ireland, the USA, Canada, Hong Kong and China. The department took the lead as the first South African department to introduce computer engineering, and it prides itself on achieving full accreditation for this programme. Since the launch of the programme, it has attracted a large number of top achievers.

Computer engineering programmes

The four-year computer engineering course (BEng) at the University of Pretoria was first introduced in 1999. An approach was followed right from the start of introducing a dedicated programme instead of modifying an existing programme. The current programme has been composed – and is continuously updated – by evaluating international experience and tendencies, taking into account the University's objective of local relevance and international competitiveness.

The computer engineering programme initially covers essential building blocks, such as electronics, control systems, information theory, design and systems engineering, relevant computer science modules and the basic sciences fundamental to all engineering programmes, such as mathematics and physics. Advanced studies then apply this knowledge to a number of areas, which include communication (digital signal processing, networks, data encoding and transmission, data security and compression), software engineering (application development, operating systems, artificial intelligence and e-commerce) and hardware design (electro-magnetic compatibility, system specification and prototyping).

Career opportunities in computer engineering

The computer engineer understands the relevant components and the communication between components, as well as the control software required to optimise the operation and maintenance of the entire system. Computer engineers design and integrate hardware, software and communication components into complete systems. Throughout the programme, opportunities are provided for experimentation and the application of theory through practical sessions and projects in high-quality computing facilities and electronics laboratories.

Computer engineering graduates are well equipped with a wide range of skills, which make them adaptable and able to meet the demands of an evolving job market. Technology in the form of computers and computer networks are all around us. They have become such an intrinsic part of our lives that they often go unnoticed. Add to this the growing tendency for them to 'talk' to one another and the endless application opportunities, and it is clear why computer engineers will impact strongly on the present and the future.

Within the domain of information and communication technology (ICT), career opportunities are abundant, specifically with regard to the application of computer systems and associated technologies. These range from simple to complex systems, of which the majority are embedded into our surroundings and are often not even visible to the user. Such systems can be found in digital watches, PDAs, sound and video systems, security systems, cellphones and other communication systems, household equipment, modern cars, ships, aircrafts, buildings, factories, energy generation and distribution systems, agriculture, defence systems, the Internet, space exploration, operating theatres, live concerts and many more.

To date, computer engineering graduates from the University of Pretoria have found employment with organisations such as Telkom, MTN, Vodacom, Cisco, Denel, Grintek, Accenture, Siemens,

IBM and the Council for Scientific and Industrial Research, to name but a few. The quality and skills of these graduates have resulted in a lot of positive feedback and the demand from industry is growing as the programme gains more exposure.

A fair number of graduates are pursuing their postgraduate studies at the University of Pretoria and at overseas universities.

Areas of interest

Computer engineering is universally applicable. In South Africa and worldwide, its application to date has focused mainly on the areas of medicine, asset management and security, although its application is indeed limitless, as can be illustrated by the following areas of interest.

- Asset management. Companies in the USA and Europe, such as Marks & Spencer, are already using radio frequency identification devices (RFIDs) to conduct asset management. A system developed by a student, which keeps track of the movement of gambling machines and indicates which ones are out of order, has been earmarked for implementation by casinos.
- Medicine. By 'tagging' patients with small RFIDs instead of the standard identification bracelet upon their admission to hospital, nursing staff have immediate access to the patient's medical history.
- Security. Access control to business premises can be done completely electronically with wireless sensor networks (WSN). Sensors can be used to 'read' the registration numbers and store these numbers on a data network. Cash-in-transit operations could also benefit from this application.
- Pharmaceuticals. RFIDs are used in numerous countries as a way of keeping false, untested pharmaceutical products off the shelves.
- Transport. In the USA and throughout the European Union, 'intelligent transport systems' that

rely on information received from strategically placed sensors are the order of the day, for instance informing travellers of accidents and suggesting alternate routes on huge overhead computer boards.

- Supermarkets. By using RFIDs instead of bar codes, a loaded supermarket trolley can simply be pushed through a sensor, providing an instant reading of the amount owed.
- Safety and security. Parents can attach a small RFID to their children's clothing when they enter a public playground, for example, to keep track of their whereabouts.

In a nutshell, computer engineering is a dynamic discipline that remains an exciting career option and a rewarding profession for anybody who enjoys being challenged. ➔

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