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# OVERVIEW

Central University of Technology, Free State (CUT) acknowledges the important role of the third mission of universities, namely Community Engagement. Community Engagement is commonly known as the active interaction between the university and its communities. The basis of this interaction is the university's expert knowledge, practice and innovation.

At CUT this mission is driven through three key values:

- Community Engagement must be rolled out via the curriculum both at undergraduate and postgraduate level;
- Service Learning and Work-integrated Learning are powerful curriculum strategies to deliver on community engagement;
- Community Engagement projects should be rolled out via a triple helix approach (university/business and industry/government) to enrich application opportunities and to benefit social communities (as end users in the triple helix model).

These key values are informed by a draft CUT Community Engagement policy, philosophy and strategy that are currently being discussed by the University's community. CUT's Community Engagement framework is based on the University's Vision 2020 statement.

This brochure reflects on CUT's community engagement projects for 2013. Since Community Engagement activities are ongoing, dynamic in contents and shaped according to available needs and expertise, the agenda on community engagement can never be closed.

We invite you to be part of this exciting CUT mission driver!

# Professr Laetus Lategan

Dean: Research and Innovation

# Community Engagement at CUT

# BRIEF ON COMMUNITY ENGAGEMENT STRATEGY

CUT's focus continues to be on socio-economic development, innovation, development and transformation. Important aspects of Community Engagement are the new National Development Plan and its guiding documents, as well as the sustainability of projects in this regard.

The new National Development Plan reinforces the notion of socio-economic development and innovation, improved education, skills development, job creation, and a better society overall. Community Engagement strives to meet these goals via various modes of service delivery that occur through the curriculum at undergraduate and postgraduate levels. Learning occurs through work-integrated learning, service learning and classroom teaching, but this engagement would not be effective without the co-operation of our triple-helix partners, namely business, government and industry, with the community as the end user.

The model of Community Engagement encapsulates how CE functions at CUT. It is executed through the following foci areas:

- Eradicating poverty and related conditions
- Promoting human dignity and health
- Increasing social capacity
- Development
- Education
- Balancing a sustainable environment with a competitive industry

The modes of delivering on these foci areas are divided into the following programmes: Teaching, Training, Research, Skills Development and Professional Development. Sustainable Development, Innovation, Incubation and Entrepreneurship form the overarching goals of CE.

The learning process of Community Engagement is necessary for human capital development and the knowledge economy. CE is something that can be considered as a lifelong and life wide process which enables students to become citizens that are better equipped to face the world. Of great significance is the engagement process. The understanding and the capacities of the students in a global setting enable and equip them for action and proper transformation as a good citizen.

# Mrs Jeeva Munsamy

Community Engagement Manager

 Tel.:
 051 507 3583

 Fax:
 086 530 8933

 E-mail:
 jmunsamy@cut.ac.za

# MODEL OF CE AT CUT





# FACULTY OF ENGINEERING AND INFORMATION TECHNOLOGY

### ANNUAL CAREER SCHOOL PROJECT

The Annual Career Winter School is a Faculty-specific programme with Engineering-related information provided to Grade 10 to 12 learners over three days during the June recess. Learners from different secondary schools in the Free State, Northern and Eastern Cape participate in this Winter School project. The purpose of the school is to have more informed learners with regard to admission requirements and content of different engineering programmes, and to have potential students more focused on choice of career.

### Project Leader: Mr B.W. Jeremiah

Tel.: 051 507 3070

E-mail: bjeremia@cut.ac.za

Faculty of Engineering & Information Technology: 051 5073255

#### COMPUTER BUILDING

In this module, the emphasis is on the hardware aspect of a personal computer in view of enhancing curricula-based learning and teaching skills for entrepreneurial development. With CUT as the partner and first-semester students as our community, focus areas include:

- Developing skills and enhancing achievement;
- Establishing entrepreneurial skills;
- Serving as a practical demonstration of the curriculum; and
- Serving as a practical example of what is expected in a job environment.

# Project Leader: Dr N.J. Luwes

Tel.: 051 507 3449

E-mail: nluwes@cut.ac.za

Faculty of Engineering & Information Technology: 051 5073255

#### **IT-BASED SYSTEMS**

IT-based systems are being developed by IT students to address the needs of up and coming businesses. These businesses vary from formal businesses such as guest houses to informal businesses such as "spaza shops". Further the IT presence assists them in having a web presence, enhances efficiency in their daily operation and provides the effective means of expanding the economic reach of their businesses. This programme allows for

students to utilise their creative and innovative energy in transforming simple concepts to dynamic innovations.

Project leader: Ms M. Venter

Tel.: 051 507 3096

E-mail: marisa@cut.ac.za

Faculty of Engineering & Information Technology: 051 5073255

# **CISCO TRAINING**

Networking classes were given to industry employees and FET College lecturers to improve their networking knowledge and skills. This training improves the networking skills of industry. Networking skills like routing and switching is added and work on real equipment. Extra skills in basic configuration, routing, switching and WAN are added.

These skills enable people to apply for better jobs and for further study.

# Project leader: Mrs L. Meiring

Tel.: 051 507 3655

E-mail: Imeiring@cut.ac.za

Faculty of Engineering & Information Technology: 051 5073255

# DUTCH REFORMED CHURCH – KLIPKERK

Basic computer literacy training in Microsoft Word, Microsoft PowerPoint and Microsoft Excel were given to about 15 participants from the community. The participants included both employed as well as unemployed individuals. This training showed an improvement of computer skills, including computer applications that assist individuals with word processing, spreadsheets and presentation software.

# Project leaders: Mr S. Viljoen

Project Contributors: Mr P. Potgieter, Mr N. Raboqhwa, Ms W. Kuyler, Ms A. vd Linde

Tel.: 051 507 3096/3098/3031

E-mail: sviljoen@cut.ac.za; pieter@cut.ac.za; nraboqhw@cut.ac.za And litumeleng@cut.ac.za

Faculty of Engineering & Information Technology: 051 507 3255

# CONTRACTOR DEVELOPMENT PROGRAMME (CCC TRAINING)

Construction Management skills are offered to emerging, small and medium size construction enterprises for the Department of Police, Roads and Transport, as the client. Internal staff participants involved in this project is from the different departments of the Faculty. The external partner is the Department of Police, Roads and Transport, FS. This project works engages with 107 learner contractors.

### Project leader: Mr M Border

Tel.: 051 507 3303 E-mail: mborder@cut.ac.za

Faculty of Engineering & Information Technology: 051 5073255

### CONTRACTOR INCUBATOR PROGRAMME

This project takes place with thirty contractors in conjunction with the National Department of Public works. The project focusses on the following; programmes relating to business analysis (business planning) and development of an IT toolkit for improved site efficiency and productivity. Internal staff participants involved in this project is from the different departments of the Faculty.

# Project leader: Mrs E Greyling

Tel.: 051 507 3089 E-mail: egreyling@cut.ac.za

Faculty of Engineering & Information Technology: 051 5073255

### VODACOM DEVELOPERS PROGRAMME

Classes are given to local application developers to enable them to be more knowledgeable about mobile concepts and the requirements needed in order to create professional mobile applications based on the Android platform. The aim of this programme is to establish a centralised hub in CUT and the Free State which will allow developers to have access to hardware- and expert-based knowledge from industry.

# Project leader: Mr A vd Walt

Tel.: 051 507 3099 E-mail: bvdwalt@cut.ac.za

Faculty of Engineering & Information Technology: 051 5073255



# FACULTY OF HEALTH AND ENVIRONMENTAL SCIENCES

### SERVICE LEARNING IN AGRICULTURE

The aim of the project is to empower individuals to become and remain economically active members of their communities. An integrative part of our mission is to form partnerships with communities and a service sector (National Department of Agriculture) in order to develop service learning as a core function, thereby contributing to the standing of CUT, FS as an innovative and equitable higher education institution. Service Learning takes place on the farm Kghotle outside Bloemfontein, where goats, sheep and cattle are farmed on a commercial basis.

# Project leader: Professor P.J. Fourie

Tel.: 051 507 3113 E-mail: pfourie@cut.ac.za

Faculty of Health and Environmental Sciences: 051 5073134

### SERVICE LEARNING IN AGRICULTURE: LENTORO FARM AND TRADING

This project focuses on an emerging farmer who is in possession of distributed land and who does not possess of formal education in the field of agriculture. The Department of Agriculture is the key partner in this regard. The farmer is provided with information on better farming methods which entails advanced farming techniques and formal farming education. The output is better quality vegetable production. The deliverables are soil testing, soil cultivation, crop planning, planting and harvest techniques, budgeting, as well as work-integrated learning and service learning for students.

# Project leader: Mr Z. Khetsha and Mr M. Sedibe

E-mail: zkhetsha@cut.ac.za and msedibe@cut.ac.za

Tel.: 051 507 3130/3195

Faculty of Health and Environmental Sciences: 051 507 3134



#### DORPER INTERNATIONAL

The aim of this project is to empower developing farmers to become stud farmers. The project is run in collaboration with the Department of Agriculture. Technical information on selection and breeding is offered to these farmers. This is a work-integrated learning project as well.

### Project leader: Professor P.J. Fourie

Tel.: 051 507 3113 E-mail: pfourie@cut.ac.za

Faculty of Health and Environmental Sciences: 051 5073134

# SERVICE LEARNING IN THE SCHOOL OF HEALTH TECHNOLOGY

#### Radiography - Medical Imaging and Radiation Protection

Third year Radiography students are involved in service learning. The purpose of these visits to several high schools in the Bloemfontein area is to disseminate information related to the availability of medical imaging services in the region. Furthermore, examinations such as mammography, obstetric ultrasound and bone densitometry examinations are performed, and preventative education is provided for cancer, maternal and fetal well-being, teenage pregnancy and osteoporosis.

# Project Leader: Mr R.W. Botha

Tel.: 051 507 3179 E-mail: rbotha@cut.ac.za

Faculty of Health and Environmental Sciences: 051 5073112



#### DENTAL ASSISTING

This year the students are working with an external community; Lerato Creche in Bainsvlei. Oral Health Education is provided to the pre-primary children, their parents and their caregivers. Oral hygiene students offer education and dental screenings as part of their service learning module and celebrate Oral Health Month during September of each year. Additionally, they also offer their services during September to students and staff of CUT. This service learning programme also instills the values of holistic living to these children, caregivers and parents by teaching them about the importance of exercise and growing their own vegetables.

# Project Leader: Dr D.M. Mtyongwe

Tel.: 051 507 3973 E-mail: dmtyongwe@cut.ac.za

Faculty of Health and Environmental Sciences: 051 507 3112

### SOMATOLOGY

Students were requested to contact salons, organise and teach shampooers the skill of shampooing ladies hair. Additionally, Indian head massage, scalp massage, neck and shoulder massage and hand massage are taught. Students are requested to keep record and hand in a complete portfolio, providing evidence of their project of which very positive feedback was received.

# Project Leader: Ms M. Vosloo and Ms J. Jonker

Tel.: 051 507 3127/ 3985

E-mail: mvosloo@cut.ac.za and jjonker@cut.ac.za

Faculty of Health and Environmental Sciences: 051 507 3112



# EMERGENCY SERVICE COMMUNICATION

This is a service learning project undertaken by students in EMC in chosen schools in the greater Bloemfontein area. It allows the students to make contact with the communities. It assists the students to understand the role of communication systems within Emergency Medical Services (EMS). However, it forces the students to understand that it is a partnership between the service they work for and the community that they serve. Without co-operation from members in the community the job of EMS personnel cannot be done.

# Project Leader: Mrs M. van Eeden

Tel.: 051 507 3297

E-mail: mveeden@cut.ac.za

Faculty of Health and Environmental Sciences: 051 507 3112

### HEALTH AND AWARENESS: HEALTH-RELATED ASPECTS

This is a service learning project which focuses on high school learners and a prison. Drug/ substance abuse is rife in many of these areas are rife. This project focuses on educating learners and inmates on the effects of drugs on their health.

# Project Leader: Mr P. Makhoahle

Tel.: 051 507 4022 E-mail: pmakhoahle@cut.ac.za

Faculty of Health and Environmental Sciences: 051 507 3112

# "Wheels of Hope" Outreach Project

The Wheels of Hope project was initiated by the Department of Cardiothoracic Surgery at the University of the Free State, with the focus on diagnostic and treatment aspects of heart and lung conditions, as well as a training and education programme. The project aims to determine the prevalence of rheumatic heart disease amongst learners in grades 10 to 12 at schools in Bloemfontein, Welkom, Bethlehem and Kimberley.



# Project Leader: Dr L. Botes

Tel.: 051 507 3578

E-mail: lbotes@cut.ac.za

Faculty of Health and Environmental Sciences: 051 507 3112

### MENTORSHIP PROGRAMME TO THE MANGAUNG MUNICIPALITY COMMONAGE FARMERS

This project focuses on pig breeding and selection. Field demonstrations are conducted by students for commonage farmers on the current agricultural techniques. Students also assist farmers on development of cooperatives, sustainable rural farming and rural dwellers. This entails the development of marketing strategies to ensure the above is met.

The project involves three internal staff members, two at doctoral and one at professorship level. Furthermore, the project provides an opportunity for postgraduate studies. Presently three students are doctoral candidates, five are at master's level and approximately thirty at BTech level. Thus, the project affords the students and the community involved a dual function, namely research and development.

# Project Leader: Professor D. Umesiobi

Tel.: 051 507 3272 E-mail: Umesiobi@cut.ac.za

Faculty of Health and Environmental Sciences: 051 5073112

# LIFE SCIENCES STUDENTS ORGANISATION (LISSO)

LISSO's membership is extended d to students studying in the field of Life Sciences at CUT. This organisation focusses on hygiene related issues. The strategy is on empowering communities through education. Topics of discussion are; environmental hygiene, cleaning up campaigns, anti-littering , household hygiene, etc.

# Mr. R Thomas Phekonyane

Tel: 051 507 3178 Email: rphekonyane@cut.ac.za





# FACULTY OF HUMANITIES

### SEWING TECHNOLOGY AND CRAFTS

This is a Service Learning project whereby senior students of the Department of Clothing and Fashion train unemployed women from Bloemfontein in all aspects of sewing and craft making. The training takes place under the supervision of a lecturer of the Department of Clothing and Fashion.

Project Leader: Professor F.E. Van Schalkwyk

Tel.: 051 507 3383 E-mail: fvschalk@cut.ac.za

Faculty of Humanities: 051 507 3362

### WALL MURAL AT ONZE RUST SCHOOL

Onze Rust Pre-primary School in General Hattingh Street, Bloemfontein was identified as a partner for this community project. The school's inner wall was in need of repainting.

The aim of this project was to repaint the existing wall in order to create a stimulating and positive environment for the children of Onze Rust Pre-primary School. The second aim was to document the ECP students' perspectives of the experience through the use of in-depth individual interviews. ECP students engaged with the community and applied the skills acquired in the Fine Art Drawing and Printmaking & Painting modules of the curriculum.

The most important impact of this project was the positive effect that the newly painted wall had on the children of Onze Rust Pre-primary School.

### Project Leaders: Mrs L. Nel

Tel.: 051 507 3859 E-mail: Inel@cut.ac.za

Faculty of Humanities: 051 507 3362





# FACULTY OF MANAGEMENT SCIENCES

# NATIONAL SCHOOL OF GOVERNMENT (NSG) EXECUTIVE DEVELOPMENT PROGRAMME (EDP)

The Department of Government Management is a partner in all of the three consortia involved in the presentation of the Executive Development Programme (EDP) in different centres in South Africa since 2009. The EDP is one of the high-profile management development programmes of the Presidential Strategic Leadership Portfolio (PSLDP), targeting, for instance, new and aspiring directors and chief directors in the South African public sector. The three consortia are the North-West University, Vaal University of Technology and Nelson Mandela Metropolitan University. Other individual members of the various consortia include the University of Johannesburg, Witwatersrand University, University of the Free State, Durban University of Technology and University of Kwa- Zulu Natal.

# Project Leaders: Professor T. Van Niekerk and Dr C.D. Olivier

Tel.: 051 507 3338/9

E-mail: edwardst@cut.ac.za and colivier@cut.ac.za

Faculty of Management Sciences: 051 5073220

### CENTLEC PROJECT MANAGEMENT PROGRAMME

Training in Project Management is offered to 30 supervisory staff members of CENTLEC (Mangaung Local Municipality, Electricity Utility Company). The aim of this project is to provide training in Project Management. Training is provided in the following modules on Bachelor of Technology level: Project Management Process; Microsoft Project 2007 Software; Strategic Management; Entrepreneurship; Project Quality; Project Resources; Project Research; Project Accounting; Operational Research; Excel Quantitative Management for Windows. One learner dropped out due to illness, 24 passed Project Management Process, and all passed the Strategic Management and Entrepreneurship modules.

# Project Leader: Professor D.Y. Dzansi

Tel.: 051 507 3218 E-mail: ddzansi@cut.ac.za

Faculty of Management Sciences: 051 5073220

### BASIC ACCOUNTING, COMPUTER TRAINING AND SECRETARIAL SKILLS

In the Ooshoek and Estoire communities, 32 unemployed individuals between the ages of 20 and 72 years, who have completed Grade 10, are being taught specific job skills, including training in basic accounting, Microsoft Office packages, typing skills and basic office skills.

# Project Leaders: Mr C. Hurter and Mrs E.D. Pottas

Tel.: 051 507 3215/ 5073159/

E-mail: churter@cut.ac.za and epottas@cut.ac.za

Faculty of Management Sciences: 051 5073220

#### STRONGBOW PROJECT

The STRONGBOW Project, Sustainable Tourism based On Natural resource management with Gender Balance tOwards Women, is a capacity building project developed by the Horn of Africa Regional Environment Centre (HoA-REC) to enhance the ability of Higher Education Institutions (HEIs) to enable them to provide gender sensitive quality education and training in Natural Resources Management, Tourism and Ecotourism. The principal targets of achievement by the project are staff capacity development, curriculum revision, strengthening research skills and demand driven action research methodologies, partnership development and setting up mechanisms for sustainable income generation.

The project is jointly managed by HoA-REC on behalf of the Ethiopian consortium (five Ethiopian universities) and Free University Amsterdam on behalf of the Dutch consortium. Other partner universities include KU Leuven, Belgium and Central University of Technology, South Africa.

# Project Leader: Dr René Haarhoff

Tel.: 051 507 3115 E-mail: rnel@cut.ac.za

Faculty of Management Sciences: 051 5073220

### ENACTUS/ RECYCLING PROJECT

Enactus(SIFE) functions by imparting entrepreneurial and environmental skills to community members to empower them economically and uplift their standard of living. As an organisation, it focuses on direct education and the creation of new learning experiences – economically, socially and environmentally. The SIFE community recycling project, sponsored by Harmony Gold, promotes entrepreneurship, financial literacy and environmental awareness within the community, with members encouraged to earn a living by recycling waste material.

# Project Leader: Ms Maraka Lefera

(Student: Human Resources Management)

Tel.: 076 971 7196 E-mail: lefera.maraka@gmail.com

# Faculty Adviser: Professor Crispen Chipunza

Tel.: 051 507 3218 E-mail: cchipunza@cut.ac.za

Faculty of Management Sciences: 051 5073220

# PROMOTION OF TOURISM: SOUTH AFRICAN COLLEGE FOR TOURISM (SACT) PROJECT

The aim of this project is to provide a service to SACT in Graaff-Reinet by means of academic management and the moderating of the theoretical and practical components of the subjects Culinary Studies, Food and Beverage Studies, Housekeeping, and Front Office. In this way, excellent quality standards are maintained in the hospitality training provided to 90 deserving young women from SADC member countries, primarily for employment in the various transfrontier parks.

# Project Leader: Mrs Grethé Muller

Telephone: 051 507 3235/3234 E-mail: adewet@cut.ac.za

Faculty of Management Sciences: 051 5073220

### MACCAUVLEI LEARNING ACADEMY PARTNERSHIP

CUT in partnership with Maccauvlei Learning Academy offer the B Tech Human Resources Management programme to qualified delegates. These delegates have obtained a NQF 5 qualification from the Maccauvlei Learning Academy plus a RPL, NQF 6 assessment. The delegates are middle and senior managers from the commerce and industry in a predominated Vereeniging area. The offering occurs via Study schools, block release placement and Blackboard 9.1 online support

# Project Leader: Mr T.M. van Niekerk

Tel: 051 507 3136

Fax: 051 507 3133 E-mail: tian@cut.ac.za

Faculty of Management Sciences: 051 5073220

#### COURSE IN ACCOUNTING TECHNICIANS (CERTIFICATE AND FET ADVANCED)

CUT in partnership with Association of Accounting Technicians provide learners with basic finance and accounting skills. In this way, entrepreneurship is enhanced through SMME's. AAT (SA) offers a practical qualification targeted at all staff levels, from administration to professional accounting positions. The focus of the AAT Certificate and FET Advanced Certificate is to address business needs in terms of basic finance and bookkeeping. Candidates are empowered to perform basic finance and accounting functions.

# Project Leader: Ms E. Laurence

Tel.: 051 507 3958 E-mail: elaurence@cut.ac.za

Faculty of Management Sciences: 051 5073220

#### SERVICE LEARNING IN RESTAURANT SERVICE

This is a Service Learning project where senior students of CUT's Hotel School train learners from selected schools namely: Petunia High School, Navalsig High School, Heatherdale High School and Martie du Plessis High School in Bloemfontein in all aspects of "waitering" (restaurant service). The training takes place under the supervision of a lecturer of the Hotel School. Learners are trained in all aspects of restaurant service and empowered to work as part-time waiters. The module has motivated some learners to enroll for the National Diploma in Hospitality Management. In partnership with Protea hotels selected learners who successfully completed the module in restaurant service access the opportunity to participate at the Protea Hotels in-house training programme to start their career in the hospitality industry. This is an amazing opportunity for the learners as most of them do not have the financial means to study at a Higher Education Institution.

# Project Leader: Mr J.P. Ras

Tel.: 051 507 3353 E-mail: rasj@cut.ac.za

Faculty of Management Sciences: 051 5073220



# CUT: SCHOOLS ADVANCEMENT ACADEMY (SAA)

### SATURDAY SCHOOL PROJECTS AT BLOEMFONTEIN CAMPUS

As part of CUT's Schools Advancement Academy, extra tuition is offered on Saturdays to Grade 11 and 12 learners from 27 secondary schools in Bloemfontein, Botshabelo and Thaba 'Nchu in Mathematics, Natural Sciences, Life Sciences and English. Learners are mainly from communities with adverse socio-economic conditions. Mutual & Federal, MERSETA (Mechanical Engineering and Retail Sector Training Authority) and Interstate Bus Lines are proud partners and sponsors of this project. The following has been achieved through the Saturday School project:

The following has been achieved through the Saturday School project:

- Learners are better prepared with better grades for admission to Science, Engineering and Technology (SET)-related courses at higher education institutions.
- Learners are exposed to Engineering-related courses at CUT.
- A significant number of the learners who have participated in the Saturday School project are currently enrolled for SET-related courses at CUT and other higher education institutions in South Africa, and many are making a success of their studies.

# Project Director: Mr G.V.N. de Villiers

Tel.: 051 507 3396

E-mail: gdevilliers@cut.ac.za

# Project Leader: Mr B.W. Jeremiah (Bloemfontein Campus)

Tel.: 051 507 3070 E-mail: bjeremia@cut.ac.za



# EDUCATOR MENTORSHIP DEVELOPMENT PROGRAMME (EMDP)

As part of CUT's Schools Advancement Academy in partnership with the Telkom Foundation and the Department of Higher Education and Training, recently launched this exciting developmental project, which is aimed at addressing the skills shortage among educators in the specific areas of Science, Technology, Engineering and Mathematics (STEM). The focus is on foundation and intermediate stage education, with the intention being to develop, empower and mentor educators in the required skills.

As such, a pilot project has been initiated at three schools in the Mangaung area, namely Grassland Primary School, Bainsvlei Combined School, and Kamohelo Primary School.

# Project Director: Mr G.V.N. de Villiers

Tel.: 051 507 3396 E-mail: gdevilliers@cut.ac.za

# Project Leader: Mr B.W. Jeremiah

Tel.: 051 507 3070 E-mail: bjeremia@cut.ac.za

### ANNUAL WINTER AND SPRING SCHOOL

As part of CUT's Schools Advancement Academy, an annual Winter and Spring School is presented by its School of Teacher Education. The beneficiaries for this Project are Grade 12 learners. The purpose of the Winter and Spring School Project is to assist these learners with the preparation for their final examination. The following subjects are offered at the schools Project in both English and Afrikaans:

- Accounting, Business Studies and Economics
- Life Sciences, Mathematics and Physical Science
- Geography, Engineering Design and History



# Project Director: Mr G.V.N. de Villiers

Tel.: 051 507 3396

E-mail: gdevilliers@cut.ac.za

# Project Leaders: Prof S.N. Matoti, Mr B.W. Jeremiah/ Mr T. Williams

Tel.: 051 507 3370/3326/3328

E-mail: smatoti@cut.ac.za, slitheko@cut.ac.za and twilliams@cut.ac.za

Faculty of Humanities: 051 5073362





# INNOVATION

### **INNOVATION ACTIVITIES**

Most innovation activities currently take place through the Product Development Technology Station. However, the establishment of an Innovation Fund is currently underway. This initiative will regulate the manner in which academics and graduating postgraduate students can access funds for the innovation and commercialisation activities normally required to convert research outputs that represent new intellectual property into a commercial product. CUT management allocated strategic funds for this purpose. The expectation is that this initiative will in future be managed operationally by the Office of Technology and Innovation.

# **INCUBATION ACTIVITIES**

CUT has a relatively small incubator – consisting of nine individual working spaces. These are rented out to new start-ups – preferably developing high-technology devices. The maximum incubation period is normally limited to three years, during which time those companies occupying incubation space are expected to establish their businesses in a protected environment and attend short courses in business development offered by a suitably qualified member of CUT staff. Those business entities participating in the incubator occupy furnished premises and those that meet certain, predefined criteria qualify for subsidization of their telephone, internet and stationary expenses, whilst photocopying services up to a specified maximum number of copies per month are provided free of charge.

### TALLOIRES NETWORK

CUT is a member of the Talloires Network since the middle of 2010. This is a network of 205 universities from fifty nine countries that are involved in Community Engagement as a fundamental principle of its operations – including its academic enterprise. The network publishes a monthly newsletter on modern developments in the role of engaged universities and offers high-level conferences in an effort to increase the prominence of community involvement, especially with respect to sustainable socio-economic development.

# Project Leader: Professor G.D. Jordaan

Tel.: 051 507 3580 E-mail: gjordaan@cut.ac.za

Director: Technology & Innovation

### ASSISTIVE DEVICES TO IMPROVE LIFE FOR PERSONS WITH DISABILITIES OR RHEUMATOID ARTHRITIS AND OTHER DISEASES

People with disabilities are among the poorest and the most vulnerable in society. They are often denied access to education and training, which in turn results in a lack of skills necessary for employment. An assistive device opens doors to learning, employment and social participation. There is a tendency to view people with disabilities as a homogeneous group, all requiring the same kind of intervention and the same type of device. The reality is that people with disabilities are as diverse as society itself, with each individual having his or her own unique contributions to make and needs to be met.

Currently most of the assistive devices in South Africa are imported and expensive and therefore unaffordable for provincial hospitals. As a result, such hospitals are forced to attempt to manufacture their own devices from the available materials. These devices are not patient specific, however, and not suited to the needs of all patients.

# Project Leader: Mr Gerrie Booysen

Tel.: 051 507 3526 E-mail: gbooysen@cut.ac.za

Technology and Innovation: Product Development Technology Station

#### PRODUCTION OF PRE-OPERATIVE MODELS THROUGH ADDITIVE MANUFACTURING

Reconstructive surgery involves the repair of an injured or deformed part of the body through surgical procedures. Each reconstruction is patient specific and requires a unique clinical approach. The final outcome of reconstructive surgery is largely dependent on the surgeon's ability to plan. The better the surgeon is at planning and simulating the procedure, the easier it becomes to approach the surgery with confidence and to avoid mistakes or complications. Currently, surgeons make use of aids like radiographic film, computer tomography (CT) scanning and magnetic resonance imaging (MRI) to visualise the planned procedure and to guide them through it. However, the use of these aids is limited where complicated procedures are required.



Previous research has shown that AM can be a very useful tool in the planning of surgical procedures. A model of the anatomical feature where surgery is required can be produced in a medium such as nylon polyamide from the CT data of the patient.

Having a pre-operative model of the patient considerably shortens the duration of surgery. This benefits the patient by reducing the risk of complications such as infections and excessive blood loss during prolonged surgery. Other advantages include lower costs for the patient and reduced fatigue for the surgeon.

# Project Leader: Professor Michele Truscott

Tel.: 051 5073454

E-mail: mtruscot@cut.ac.za

Technology and Innovation: Product Development Technology Station



# Sustainable Development

# SUSTAINABLE DEVELOPMENT (SD)

CUT has recently decided to embrace the principles of SD in all its activities, from its curricula to its involvement in the community. An institutional Project Committee, consisting of delegates from all main operational units in the university, has been established to develop the institution wide roll-out of SD. Members of this committee are expected to interact with their different areas of involvement and to create an awareness of SD as a phenomenon amongst staff and students, and to initiate specific projects aimed at addressing SD needs and opportunities of the university and beyond. An important characteristic of this drive is the definition of a comprehensive set of measurable criteria according to which progress with the roll-out of the project is to be monitored. These finding will be published in formal institutional SD Reports.

### SUSTAINABLE AGRICULTURAL DEVELOPMENT PROGRAMME

There is a dire need for the introduction and enhancement of technical levels of production, as well as highly skilled agricultural experts and sustainable agricultural development. A combination of structured, continuous training in technical aspects and an improved level of education is a means to attain the goal of sustainable socio-economic development. The objective is thus to ensure food security via agricultural production, along with a sustainable livelihood for these farmers, by ensuring a reasonable level of profitability from activities such as agricultural production and/or agri-processing and/or agri-tourism.

The project impact is highly significant in that historically disadvantaged individuals (HDIs) are converted from developing farmers into commercial farmers, while their socioeconomic status is greatly improved. The successful implementation of this project will lead to improved farming sustainability and higher levels of literacy among HDIs, thus creating more jobs and reducing crime.

# Project Leader: Professor Carlu van der Westhuizen

Tel.: 051 507 3434 E-mail: cvdwesth@cut.ac.za

Faculty of Health & Environmental Sciences

School of Agriculture & Environmental Sciences



### APPROPRIATE TECHNOLOGICAL DEVICES/ SMALL-SCALE FARMING IMPLEMENTS

Small-scale farming is a very important component of South Africa's economic development. Many of our farmers are currently using implements that are either very old or cost more to repair than what they are worth, or which are so expensive as to be unaffordable for farmers. Farms that are purchased for land distribution purposes often come with implements mainly suited to large-scale commercial farming activities. To be economically viable, small-scale farmers need implements that are built for South African conditions and farming methods.

This project investigates the different appropriate technologies available in developing countries around the world and identifies those that will be suited to use in South Africa.

# Project Leader: Mr Ludrick Barnard

Tel.: 051 507 3253 E-mail: lbarnard@cut.ac.za

Technology and Innovation: Product Development Technology Station

# SOLAR GREENHOUSE SYSTEM FOR LOCAL FOOD PRODUCTION

The solar greenhouse is an environmentally sustainable strategy for urban food production, aimed at providing alternatives to the basic diet while reducing the environmental footprint, cutting transportation costs, enhancing food security/safety, reducing waste, conserving water, protecting rivers, and combating global warming. The solar greenhouse makes use of a solar water heater to combat lower temperatures, thus helping to reduce fossil-fuel emissions that typically result from food production and distribution.

The objective of this project is to develop a commercial-scale solar-heated greenhouse that can be used to produce temperature-sensitive crops throughout the year. The Free State Province, although cold during the winter season, still experiences a good deal of sunshine on winter days, and the heat that is generated by the sun through radiation can be harvested, stored and used as solar power to heat the greenhouse during cold winter nights.

Methods of effectively storing this energy during the day for use at night are currently being investigated, along with techniques to block the sun's rays on hot summer days so as to

reduce the heat load on the greenhouse if necessary. Reducing the internal volume to be heated is also seen as a means of conserving energy, while a related investigation involves the development of alternative cooling methods (e.g. dry mist) for application in greenhouses.

# Project Leader: Mr F.C. Aggenbacht

Tel.: 051 507 3534

E-mail: caggenba@cut.ac.za

Faculty of Engineering & Communication Technology





# RESEARCH

# GENERAL OVERVIEW OF RESEARCH AND DEVELOPMENT ACTIVITIES

#### **RESEARCH AND INNOVATION PLAN 2011 – 2013**

#### 1. THE CHALLENGE OF THE STRATEGIC RESEARCH PROGRAMMES AND CLUSTERS

This organisation of research created a sustained pool of research outputs. These outputs are representative of an emerging research culture. This research productivity is the basis to measure progress, outcome and impact on.

The research clusters should serve as basis for future research, transfer and innovation activities.

#### 2. VISION 2020: THE 2011-2013 CHALLENGES

- The following challenges are identified for research during the period 2011-2013:
- Translate Vision 2020 to the R & I activities of the university (emphasis on research, innovation, outcome, impact, socio-economic development and sustainable development)
- Integrate research, teaching and engagement
- Grow more research participation, outputs and funding basis (on the basis of the research clusters)
- Grow university and triple helix partnerships
- Transfer and innovation activities
- The internationalisation of research
- Grow the next generation of researchers

Research management in the various stages of the research process is imperative to deliver on the research expectations of Vision 2020.

#### 3. TEACHING, RESEARCH AND ENGAGEMENT

There is a growing view that research and innovation should be understood in juxtaposition. This relates to what is commonly known as the research cycle. The research cycle can be described as the process of taking the research problem through various academic stages (such as enrolment for postgraduate qualifications, publication writing, conference papers, supervision) to the process of patenting (intellectual property), commercialisation (spin-in to business and industry and first step towards third stream income) and eventually production (spin-out and sustained third stream income). What is now required, is to extend our academic understanding of research to a broader concept of research. Where research is normally understood as to have a research question / problem for which a solution must be sought, innovation can be explained as having the solution to the problem which must now be converted into a possible product / prototype that can be commercialized. The full circle is completed when research and innovation are used as platform for engagement with government, business and industry.

# The Research Cycle must be used as a platform to integrate research and innovation, teaching and community engagement.

All staff members should participate in activities associated with research productivity.

#### 4. PROPOSED RESEARCH AND INNOVATION PLAN FOR 2011-2013

The following research clusters, programmes and foci will serve as platform for the research and innovation activities from 2011-2013:

CLUSTER	PROGRAMMES
Industrial design, communication and development	New product development and design
	Evolvable manufacturing, automation and vision systems
	Energy management
	Water Resource Management
	Information and Communication Technology
Quality of health and living	Applied food safety and -biotechnology
	Sustainable farming systems
	Applied health technology
	Environmental assessment and management
	Biotechnology

#### Table 1: Research clusters and programmes, 2011-2013

CLUSTER	PROGRAMMES
People and skills development	Socio-economic development studies
	Leisure management
	Education (sub-themes: health science education, general education, service learning, vocational pedagogy)
	Research education

The following plan is proposed to meet the challenges for 2011-2013 as outlined in paragraph 4:

FOCUS	OBJECTIVE	ACTIVITY
Scholarly Scholarly development development development de through Research de and Innovation de Training de secondaries de la construcción de la	Scholarly engagement with the research process and research cycle	Pre Doctoral training
		Doctoral Training
		Post Doctoral training
		Programme on postgraduate supervision
		Programme on scientific writing
		Programme on tech transfer and innovation
		Annual Faculty Research Seminars
		Colloquiums and discussion groups
Research	Capacity growth	Multi-, inter- and transdisciplinary research
partnership development	of research projects	Joint ventures with national and international universities, research bodies and research councils
		Joint ventures with Government/business/ industry

FOCUS	OBJECTIVE	ACTIVITY
Development of research clusters and programmes	Strengthening of research capacity	Student retention and throughput
		Publications
		Conference attendance
		Patents
		Rated researchers
		Research Funding
Development To develop the of technology institutional level transfer and of involvement innovation and expertise in technology transfer and innovation	To develop the institutional level	IP Act of 2008 and Technology Transfer Office training
	of involvement and expertise in technology transfer and innovation	Training of staff and students in innovation cycle
		Identification of research outputs for possible innovation
		Studying sustainable technological development
		Supporting the community in efforts at innovation and new product development

# KNOWLEDGE AUDITING: THE CASE OF THE CENTRAL UNIVERSITY OF TECHNOLOGY, FREE STATE (CUT)

The main aim of this project is to perform a knowledge audit at CUT. The effective utilisation of knowledge has the potential to create a competitive advantage for the university and the community it serves. The following specific outcomes apply:

- Conducting an extensive literature review of the elements that should apply in effectively creating, capturing/codifying, sharing and disseminating knowledge at CUT; and
- Assessing the knowledge management practices of academic and support staff at CUT.

# Project Leader: Professor Deseré Kokt

ResearchProfessorLeisureManagement

Tel.:051 507 3114Fax:051 507 3363E-mail:koktd@cut.ac.za

Faculty of Management Sciences

#### THE EMPLOYMENT OF HUMAN RESOURCES PRACTICES AT GUEST HOUSES IN THE FREE STATE: AN INTERVENTION-BASED APPROACH

Competitiveness is a global concern for any organisation that wants to remain relevant and in business. This especially applies to the tourism industry that needs return customers. The hospitality sector is the largest sector within the tourism domain as they employ the largest amount of employees. It has been suggested that the effective utilization of human resources could secure a competitive advantage to establishments in the hospitality sector. A worrying trend is reported by Liao, Hu & Chung (2009:1810) namely that poor employment practices exist worldwide in the tourism sector.

As employment practices naturally include human resources issues, the focus of this investigation is on the hospitality industry in the Free State, specifically guest houses. It is expected that large multinational companies (like hotels) might have structured human resource practices in place, which might not be the case with smaller family-owned businesses, like guest houses. Guest houses were selected as they are scattered throughout the province and focusing on them could provide a comprehensive picture of the hospitality industry in the Free State. As this is not always the case with other accommodation establishments (like hotels, camping sites and self-catering accommodation) they were not included in the study. The findings from this investigation could also assist guest houses in the other provinces of South Africa.

#### Project Leader: Professor Deseré Kokt

Research Professor: Leisure Management



 Tel.:
 051 507 3114

 Fax:
 051 507 3363

 E-mail:
 koktd@cut.ac.za

School for Tourism, Hospitality and Sport

#### CHARACTERISATION OF THE MICROBIAL DIVERSITY IN FOOD INDUSTRY RELATED EFFLUENTS IN THE FREE STATE

Water quality is no longer considered to be the sole obligation of a single authority, but is becoming the responsibility of all levels of the community, including industry, local government as well as individual water users. The food industry is one of the most important sectors among the manufacturing industries. The processes involved in manufacturing food products generally require large amounts of water which contribute to pollution loads discharged into the wastewater system. Despite strict legislation on effluent composition, the enforcement thereof remains problematic emphasising the necessity for traceable downstream monitoring. Studies using molecular techniques to monitor microbial diversity during wastewater treatment have demonstrated the usefulness of this approach to identify bio-communities that influence the final effluent quality. The potential to benefit from exploring the applicability of the same approach to generate microbial diversity profiles for individual industrial wastewater contributors remains untapped.

# Project leader: Dr O. De Smidt

Researcher: Environmental Sciences

 Tel.:
 051 507 3851

 Fax:
 051 507 3435

 E-mail:
 odesmidt@cut.ac.za

Faculty of Health and Environmental Science

# THE KAROO RIVIERA: CROSS-BORDER TOURISM DEVELOPMENT PLAN FOR THE MIDDLE ORANGE RIVER

The middle Orange River system or "Karoo Riviera" incorporates the area ranging from the Gariep Dam to the Vanderkloof Dam. The tourism potential of this area is largely untapped, and due to the wide geographical spread of the Karoo, tourism development is unable to reach its full potential. Development and marketing plans must be addressed at local, district and provincial level, which poses a challenge to tourism managers and policymakers, since co-operation across provincial borders is never easy. Integrated tourism development as envisaged by local government is inhibited and constrained by demarcated physical boundaries between and within provinces and municipalities in the relevant provinces, thus inhibiting the optimal tourism development of the middle Orange River system. The objective is to develop a cross-border tourism development plan for the Karoo Riviera.

# Project Leader: Mr Johan Hattingh

Tel.: 051 507 3288 E-mail: jhatting@cut.ac.za

Faculty of Management Sciences



# Centre for Rapid Prototyping and Manufacturing (CRPM) and Product Development Technology Station (PDTS)

#### ADDITIVE MANUFACTURING SERVICE TO INDUSTRY AND RESEARCHERS

The Centre for Rapid Prototyping and Manufacturing (CRPM) offers state-of-the-art equipment to accelerate the manufacturing of products using a variety of additive manufacturing (AM) techniques, i.e. rapid tooling and rapid manufacturing. This financially self-sustainable activity was established with the assistance of government agencies such as the Technology and Human Resources for Industry Programme (THRIP), the National Research Foundation (NRF) and various industrial partners. These partnerships have played a role in putting the CRPM at the forefront of AM research in South Africa and internationally.

The products delivered by the CRPM serve as prime examples of the efficacy and productivity of the South African manufacturing industry, while simultaneously allowing students – both undergraduate and postgraduate – to engage in work-integrated learning and to gain industrial engineering experience. The CRPM's vast customer base includes local entrepreneurs and international companies, with approximately 500 commercial projects being completed annually. Approximately eight to nine percent of the annual turnover is spent on the production of research models.

### Mr Gerrie Booysen

Tel.: 051 507 3526 E-mail: gbooysen@cut.ac.za

Technology and Innovation: Product Development Technology Station

# PRODUCT DEVELOPMENT TECHNOLOGY STATION (PDTS) – NEW PRODUCT DEVELOPMENT

The Product Development Technology Station (PDTS), as part of the Technology Innovation Agency (TIA), has the necessary facilities to provide technological support to small, medium and micro enterprises (SMMEs) and private individuals seeking to design and manufacture first-generation prototypes of new products in view of possible manufacturing in South Africa. The PDTS has links with various companies in the manufacturing process, and each project is evaluated to determine viability. The client is assured of professional assistance every step of the way in the development process. Technical skills transfer to employees in industry is of key importance in this programme



# Mr Ludrick Barnard

Tel.: 051 507 3253 E-mail: lbarnard@cut.ac.za

Technology and Innovation: Product Development Technology Station

### CASTING OF ART WORKS OF LOCAL ARTIST

PDTS recently trained eight local artists to manufacture silicone moulds of their artworks. This will enable them to reproduce the original artworks and sell copies of the work and become economically sustainable. The artists worked in different mediums such as steel-filled plastic and other plastics suitable for casting. By doing this, they are encouraged to investigate how they can produce different looks of the artwork they started with. This was a great success and PDTS plans to do this once a year.

### Project Leader: Mr Ludrick Barnard

Tel.: 051 507 3253 E-mail: lbarnard@cut.ac.za

Technology and Innovation: Product Development Technology Station

#### NATIONAL MEDICAL DEVICE INNOVATION PLATFORM (NMDIP) – DEVELOPMENT OF MEDICAL DEVICES FOR RESEARCH AND COMMERCIAL PURPOSES

The primary aim of the National Medical Device Innovation Platform (NMDIP) is to develop well-manufactured medical implants and devices for use by clinical practitioners in the treatment of patients, keeping in mind that the success of any medical implant is dependent on the overall condition – medical and otherwise – of the patient in question, as well as the nature of the trauma to which that patient has been exposed. The Medical Research Council (MRC), local clinical practitioners and external private funding agencies are the community partners in this project, with the MRC acting as facilitator of participating universities. The programme also serves as a funding channel for postgraduate students, especially those from previously disadvantaged groups.

# Professor Michele Truscott

Tel.: 051 507 3454 E-mail: mtruscot@cut.ac.za

Technology and Innovation: Product Development Technology Station

# PDTS SHORT COURSES OFFERED TO STAFF, STUDENTS, AND TECHNICAL STAFF FROM INDUSTRY

### COURSE IN PLASTICS

The PDTS offers a short course in Plastics for interested staff and students, as well as technical staff in industry. The course, which is presented by an expert in the field, gives attendees a much better understanding of the processes involved in the manufacturing of plastic products, as well as the various uses for plastic. The knowledge gained during the course can be used to advise SMMEs on the use of plastics, thus serving as a form of community industrial support.

#### **COURSE IN WIRE-CUTTING**

Working jointly in a community partnership with Kopaneng Converters (Pty), the PDTS and CRPM offer a Wire-cutting course that teaches participants to operate a wire-cutting machine and cut the necessary parts.

### BASIC COURSE IN SOLID WORKS

The PDTS offers a basic course in Solid Works to staff and students, as well as technical staff in industry. The training includes design and drawing techniques using computer-aided design (CAD) in 3D. A person who has completed the course will be equipped with basic skills in Solid Works, as well as the ability to complete projects within a shorter time period.

### INTRODUCTION TO SKETCHING AND DRAWING

The PDTS is the community partner in the presentation of this course to staff and students, designed to create a better understanding of the use of sketching in the design process and their subsequent involvement in the development of products. Attendees are taught to translate their concepts into sketches before commencing with CAD.



### ADVANCED COURSE IN SOLID WORKS

Working as joint community partners, the PDTS / CRPM present an advanced course in Solid Works, where attendees are trained to work effectively and efficiently in utilising all the available functions. The course allows attendees to improve their design skills using CAD in 3D, and to use CAD more efficiently to complete projects in a shorter period of time.

#### ADVANCED COURSE IN SKETCHING AND DRAWING – INCLUDING RENDERING FROM CAD

This course is presented by an expert in the field and teaches attendees to make better use of sketching in the design process. Attendees learn the skill of first sketching their concepts before commencing with CAD.

### BASIC COURSE IN FINITE ELEMENT ANALYSIS (FEA)

This course, which is presented by an expert in the field as has the PDTS as the community partner, enables attendees to develop a product by means of CAD and then transfer it to the FEA process, thus ensuring sufficient strength of the product.

#### COURSE IN TOOL DESIGN

This course, which is offered to students, staff and external participants, provides a better understanding of the tool design and manufacturing process. Attendees are then able to make provision for tooling in their own design processes, thus enhancing their final product.

### COURSE IN COMPUTER NUMERICAL CONTROL (CNC)

This PDTS-supported course is presented to students, staff and external participants, giving them a better understanding of CNC machines and computer-aided manufacturing (CAM) software. Attendees are taught how to write a CNC program and run it on the machine, and also how to use the machine to cut parts and tools.



# EXAMPLES OF SUCCESSES WITH INCUBATION

# SOFTWARE DEVELOPMENT AND APPLICATION

A former CUT student, who graduated with a degree in Electrical Engineering in 1991, is now the owner of a leading point-of-sale (POS) business. He first started developing his batterypowered POS system in 1998, and he subsequently joined the CUT Incubation Programme at the Science Park in 2001. The Centre for Rapid Prototyping and Manufacturing (CRPM) provided initial assistance with the development of components for the POS unit, whilst he and his team developed the necessary software. While working with the Incubation Programme, his team received assistance in the form of office/workshop space, as well as administrative, office management and technical assistance from the CRPM.

With over 18 years of programming and retail experience, well-trained employees and innovative product improvements, the company provides top corporate and general retail clients with the very best sales and after-sales service. As a recognised leader in the POS, network support and maintenance service industry, the company sells a wide range of scanners, label printers, slip/receipt printers, cash drawers, touch screens and various other POS-related products. Due to the high demand for stock-control functions in shop security systems, the company also sells a wide range of CCTV and access-control products. With full integration into the POS software, clients can now search for specific transactions on their CCTV recordings.

The company's head office is situated in Bloemfontein, and there are more than 18 branches countrywide – three of which are owned by the business owner himself and employ thirty staff members. With over 9 000 POS packages already sold to small and medium-size businesses nationwide, the company has proven itself to be highly competitive. Thanks to these successes and a comprehensive resale channel built up over ten years, the company is now one of the largest suppliers of POS software in South Africa, with an annual turnover of between R11 million and R12 million.

# COMPUTER AND SOFTWARE RETAIL

Another former CUT student, who graduated with a BTech in Mechanical Engineering in 2002, is now the owner of a successful computer and software retail business. During his studies at CUT, he was employed as a student assistant in the CRPM. After graduating, he entered the CUT Incubation Programme and launched an IT support and computer service and maintenance enterprise, incorporating hardware sales, website hosting, internet service

provision, network installations, and the supply and installation of CCTV camera systems. He initially employed a deserving student to assist with the servicing of computers whilst he was involved in the part-time maintenance of CRPM equipment.

After leaving the incubation programme in 2007, he opened an office in Bloemfontein, for which he received support from CUT in the form of subsidised office space, access to office facilities like a fax machine and photocopier, as well as general office assistance. According to him, the support he valued most was the advice and assistance he received from the Science Park personnel.

This successful business owner recently opened an office in Kimberley to serve the Northern Cape area and is in the process of signing a contract for another branch in the Eastern Cape. The company employs a total of 14 people and has an annual turnover of about R5 million.

#### Professor G.D. Jordaan

Tel.: 051 5073580 E-mail: gjordaan@cut.ac.za

Director: Technology & Innovation





# Contact us

Tel.:	051 5073583/3279
Fax:	051 4489379
Email:	jmunsamy@cut.ac
	llategan@cut.ac.za

