2010

Fakulteit Ingenieurswese **JAARVERSLAG**

Faculty of Engineering **ANNUAL REPORT**

INHOUD

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In 2010 kon die Fakulteit Ingenieurswese sterk aanklank vind by die HOOP Projek van die Universiteit Stellenbosch, want ingenieurs is uit die aard van hul werk by uitstek skeppers van hoop.

Die Fakulteit se hoopskeppende sterktes is top navorsing, gehalte opleiding en uitgebreide gemeenskapsinteraksie-projekte wat 'n blywende en positiewe impak op mense en gemeenskappe maak.

Navorsing wat 'n verskil maak

Al vyf die Fakulteit se departemente is aktief betrokke by die Universiteit Stellenbosch (US) se drie groot inisiatiewe op die terreine van *Energie en die Omgewing, Kommunikasie en Inligtingstelsels,* en *Voedselsekerheid*.

Die eerste een, *Energie en die Omgewing*, behels sewentien projekte op die gebiede van energiedoeltreffendheid; elektrifisering van verafgeleë en landelike gebiede; hernieubare energie; die verwydering van skadelike afvalstowwe; watergehalte en waterbestuur; en die verbetering van die doeltreffende gebruik van hulpbronne vir besighede in die klein-, mikro- en mediumsektore. Navorsing oor energiedoeltreffende boumateriaal is 'n voorbeeld van 'n projek wat onder energiedoeltreffendheid val.

Die twaalf projekte van die tweede een, *Kommunikasie en Inligtingstelsels*, fokus op menslike interaksie met rekenaars om toeganklikheid vir die Suid-Afrikaanse bevolking te vergroot; die ontwikkeling en toepassing van intelligente besluitnemingsondersteuningstelsels vir die prosesindustrieë; die ontwikkeling en verhoging van ontwerp en konstruksie kommunikasiemetodes in die siviele ingenieursbedryf; die ontwikkeling van inligtingstelsels in verkeer en padveiligheid; en nuwe kommunikasiestelsels. 'n Goeie voorbeeld van 'n projek wat onder laasgenoemde gebied val, is afstandswaarneming- en kommunikasietegnologieë om gewasse, waterbronne, wild en stedelike ontwikkeling deur middel van satelliete en onbemande vliegtuie te monitor.

Voedselsekerheid, die derde van die drie groot inisiatiewe, het projekte op die gebiede van geoutomatiseerde onbemande vliegtuie; tweede generasie biobrandstowwe; die modellering van indringerspesies en saadverspreiding van plante; die doeltreffende gebruik van waterhulpbronne om die beskikbaarheid van water te maksimeer; die ontwikkeling van biogebaseerde materiale vir verbeterde oesopbrengs; en die verbetering van prosesse en tegnologie-oordrag vir opkomende, maar hulpbron-arm boere, vissers en kleinsake entrepreneurs in Suid-Afrika. Een van die nege projekte in die voedselsekerheid-stal, biobrandstofproduksie en die werkverrigting van bio-etanol in moderne dieselenjins, is 'n voorbeeld van 'n projek wat oor tweede generasie biobrandstowwe handel.

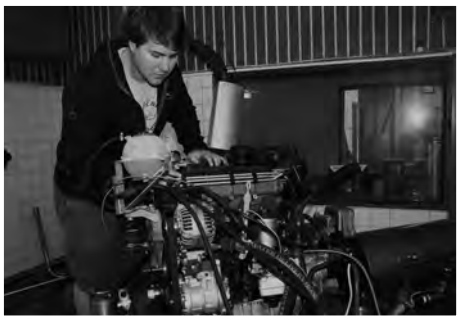
Uit die R300 miljoen wat deur die US Raad aan fakulteite vir projekte beskikbaar gestel is, het die Fakulteit Ingenieurswese die grootste aandeel (R56.5 miljoen) as saadgeld ontvang. Die Fakulteit het dit ook reggekry om industrie in so 'n mate te inspireer dat die ingenieursbedryf in die eerste 18 maande van die HOOP Projek R41 miljoen addisioneel in die vorm van derdegeldstroom-inkomste tot die uiters belangrike projekte bygedra het.

Met die omvangryke navorsingsprojekte lewer die Fakulteit beslis 'n stewige bydrae tot die Universiteit se poging om die lewensgehalte en lewenstandaard in Suid-Afrika te verbeter.

Meer ingenieurs vir die land

Die Fakulteit werk die afgelope paar jaar onverpoosd voort om die groot tekort aan ingenieurs in Suid-Afrika te probeer verlig deur jaarliks meer gegradueerde ingenieurs te lewer. Dit vereis egter dat meer studente ingeneem moet word. Bo en behalwe die goed-beproefde bemarkingsveldtogte soos die Ingenieurswese Opedag en Winterweek, is inligtingsessies aan top leerders en hul ouers in ses provinsies en Namibië aangebied. As gevolg van al die werwingsinisiatiewe was daar 'n goeie getal toelatings van bykans 700 nuweling eerstejaars in 2011.

Toegang tot ingenieurstudie op Matieland is moontlik vir alle studente wat aan die toelatingsvereistes voldoen en goeie potensiaal toon. Parallelmediumklasse in Afrikaans en Engels vir eerste- en tweedejaars, asook ondersteuning aan studente met taalagterstande, maak dié fakulteit een van die taalvriendelikstes op kampus. 'n Alternatiewe program tot toelating (Basisprogram) is in 2010 ingestel.



Een van die Fakulteit se navorsingsprojekte op die terrein van voedselsekerheid is biobrandstofproduksie en die werkverrigting van bio-etanol in moderne dieselenjins.

One of the Faculty's research projects on the terrain of food security is the production of biofuel and the performance of bio-ethanol in modern diesel engines.

In 2010 the Faculty of Engineering was able to respond positively to Stellenbosch University's HOPE Project since engineers, by the very nature of their work, are creators of hope par excellence.

The hope-creating strengths of the Faculty are top-level research, quality training and extensive community interaction projects that make a positive and lasting impact on people and communities.

Research that makes a difference

All five of the Faculty's departments are actively involved in Stellenbosch University's (SU) three large initiatives on the terrains of *Energy and the Environment, Communication and Information Systems,* and *Food Security*.

The first initiative, *Energy and the Environment*, includes seventeen projects in the areas of energy efficiency; electrification of remote and rural areas; renewable energy; removal of harmful waste by-products; water quantity and quality management; and improvement in the efficient use of resources for businesses in the SMME sector. Research on energy efficient building materials is an example of a project which falls under the heading of energy efficiency.

The twelve projects of the second initiative, *Communication and Information Systems*, focus on human interaction with computers to enhance accessibility for South Africa's population; the development and application of intelligent decision support systems for process industries; the development and enhancement of design and construction communication methods in civil engineering; the development of information systems for traffic and road safety; and novel communication systems. A good example of a project which falls in the latter area is remote sensing and communication technologies to monitor crops, water, wildlife and urban development.

Food security, the third of the three large initiatives, includes projects which cover automated aircraft; second generation biofuels; modelling of alien invasive species and seed distribution of plants; efficient use of water resources to maximise water availability; development of biobased materials for improved crop production; and process improvement and technology transfer to the upcoming, but resource poor, farming, fishing and small entrepreneurial sectors within South African communities. The production of biofuel and the performance of bio-ethanol in modern diesel engines is an example of one of nine food security projects.

Of the R300 million made available by the University Council for projects, the Faculty of Engineering received the largest share (R56,5 million) as seed money. In addition to this, the Faculty has also managed to inspire industry to contribute an additional R41 million by means of third-stream income for these projects in the first 18 months of the HOPE Project.

With this wide range of research projects the Faculty is making a solid contribution towards the University's initiative to improve the quality of life and standard of living in South Africa.

More engineers for the country

The Faculty has spent the past few years working tirelessly to reduce the great shortage of engineers in South Africa by producing more graduate engineers every year. However, this requires that more students have to be taken in. In addition to the tried and tested marketing campaigns, such as the Engineering Open Day and Winter Week, information sessions were held for top learners and their parents in six provinces and in Namibia. As a result of these recruitment initiatives close to 700 new first-year students received admission for 2011.

Access to engineering studies in Matieland is possible for all students who meet the admission requirements and show potential. Parallel medium classes in Afrikaans and English for first- and second-year students, as well as support for students with language backlogs, make this Faculty one of the friendliest on campus as far as language is concerned. An alternative route for admission (Foundation Year) was introduced in 2010. It entails a year of study in preparation for the BEng and is aimed primarily at coloured, black and

Ouers en leerders wat die Ingenieurswese Rolmodellefunksie bygewoon het.

Parents and learners who attended the Role Models in Engineering function.

Dit behels 'n vooraf jaar van studie ter voorbereiding vir die BIng vir hoofsaaklik onderwys-benadeelde bruin, swart en Indiërstudente wat net-net die vereiste puntetelling vir toelating mis, maar steeds die verlangde prestasie in Wiskunde en Fisiese Wetenskappe op skool behaal het.

Nagraadse getalle

Aggressiewe studentewerwing en bemarking die afgelope paar jaar het vrugte afgewerp en gelei tot die eerste groot inname van eerstejaars in 2006. Hierdie eerstejaars het in 2010 nagraadse vlak bereik en dit het 'n rol daarin gespeel dat die aantal nagraadse studente in 2010 'n goeie styging getoon het. Die totale aantal M-studente was in die verslagjaar 500 in vergelyking met 417 in 2009. Ook die getal PhD-studente het hierdie stygende tendens getoon, met 124 in 2010 tenoor die 96 die vorige jaar.

Gemeenskapsinteraksie wat horisonne verbreed

In teenstelling met die algemene persepsie dat die Ingenieursbedryf hoofsaaklik op die verbetering van tegnologie en lewensomstandighede fokus, is dit ook mensgerig. Die Fakulteit is aktief betrokke by 16 gemeenksapsinteraksie-projekte wat skole-uitreike en diensleer insluit, asook kontraknavorsing wat deur sy institute en sentra uitgevoer word. Twee van bogenoemde uitreik-aksies is gemik op die uitbreiding van studentediversiteit. Vanjaar het 70 Graad 12-leerders en hul ouers die Ingenieurswese Rolmodellefunksie bygewoon wat knap leerders uit bruin, swart en Indiërgeledere aanspoor om Matie ingenieurs te word. Agt jaar lank bemark die Fakulteit ook reeds ingenieurswese spesifiek onder meisies en in 2010 het 237 skooldogters wat in Wiskunde en Wetenskap uitblink, die Vroue in Ingenieurswesemiddag bygewoon. 'n Nuwe uitreik, die Broeikasprojek, het in Desember afgeskop met ongeveer dertig Graad 6-leerders van plaaslike laerskole wat genooi is om daaraan deel te neem. Die doel is om dié kinders, wat reeds op vroeë ouderdom 'n aanleg vir Wiskunde en Wetenskap toon, aan ingenieurswese bloot te stel, in die hoop om belangstelling in die loopbaan by hulle te prikkel. Hulle sal tot hul Matriekjaar die Fakulteit jaarliks besoek om hul belangstelling vas te sement. Daar word ook beoog om elke jaar 'n nuwe oes Graad Sesse in te neem op die Broeikasprojek.

Die module *Samelewing in Perspektief* het die jaar goed momentum gekry. Agthonderd leerders van plaaslike hoërskole het gebaat by Wiskunde tutoriaalklasse wat deur 210 senior studente aangebied is. Die doel hiervan is drieërlei: om leerders bewus te maak van ingenieurswese as beroep, om hulle te help om beter slaagpunte in dié vak wat noodsaaklik vir ingenieurwese is, te behaal, en om 'n groter poel waaruit ingenieurs geskep kan word, op te bou. Studente baat eweneens by hierdie projek deurdat hulle met 'n groter sensitiwiteit vir dienslewering aan die gemeenskap opgelei word.

Sentra en institute gesond

Die institute en sentra van die Fakulteit is finansieel gesond. Die strammer ekonomiese toestande wat wêreldwyd ervaar word, is heelwaarskynlik die rede waarom die totale inkomste van die sentra en institute vanaf 2009 met 10% tot R81,5 miljoen gedaal het. 'n Bedrag van R42 miljoen, ongeveer 52% van dié inkomste, is deur die sentra en institute herbelê in die vorm van beurse aan studente, navorsingsmateriaal, toerusting, programmatuur, boeke, navorsingsreise, en lidmaatskap van professionele verenigings, asook die US heffing. Hieruit blyk dit duidelik dat die sentra en institute 'n groot bate vir die Fakulteit is.

Alumnibande verstewig

Die Fakulteit Ingenieurswese het sy bande met oud-studente verstewig deur gesellige en feestelike dinees in Stellenbosch en Sandton aan te bied vir alumni wat hul graad in die periode 1970 tot 1979 ontvang het. By die geleentheid het die dekaan, prof Arnold Schoonwinkel, die Fakulteit se Visie 2020 met hulle gedeel en ook 'n beroep op hul finansiële ondersteuning vir die Visie gedoen. Alumni het entoesiasties op die versoek reageer en ruim vir die Dekaansfonds geskenk.

2010 was vir die Fakulteit Ingenieurswese voorwaar 'n goeie jaar met vele dinge wat in plek geval het. Dit verskaf 'n goeie basis ter realisering van Visie 2020.

Die Broeikasprojek poog om belangstelling in ingenieurswese te prikkel by jong leerders wat 'n aanleg in Wiskunde en Wetenskap toon.

The Incubator project aims to stimulate interest in engineering in young learners who show an aptitude for Mathematics and Science.

Indian students (from disadvantaged schools) who have only just missed out on the required marks for admission, while having achieved the required marks in Mathematics and Physical Sciences.

Postgraduate students

Aggressive student recruitment and marketing over the past couple of years have borne fruit, and led to the initial high intake of first-year students in 2006. In 2010 these students had reached the postgraduate level which resulted in an increase in postgraduate student numbers. The total number of master's students was 500 in the period being reported compared to 417 in 2009. The number of PhD students also showed the same rising trend, with 124 in 2010 compared to 96 in 2009.

Community interaction broadens horizons

The engineering industry does not focus mainly on technology. It is also people oriented. The Faculty, consequently, is actively involved in 16 community interaction projects that include schools outreaches and service learning, as well as contract research undertaken by its institutes and centres. Two of these outreach actions are aimed at increasing student diversity. This year 70 Grade 12 learners and their parents attended the Role Models in Engineering function that encourages bright coloured, black and Indian learners to become Matie engineers. For eight years the Faculty also has been marketing engineering specifically among girls, and in 2010 237 schoolgirls who excel in Mathematics and Science attended the Women in Engineering afternoon.

A new outreach programme, the Incubator project, was launched in December. Thirty Grade 6 learners from local primary schools were invited to participate. The aim is to expose children, who show an aptitude for Mathematics and Science at an early age, to engineering in order to stimulate their interest in this career. They will visit the Faculty annually up to their Matric year to ensure reinforcement of a solid interest. Each year another new group of Grade 6 learners will be taken in on the Incubator project.

The module *Society in Perspective* gained good momentum this year. Eight hundred learners from local high schools benefited from Mathematics tutorial classes presented by 210 senior students. The aim of this is threefold: to make learners aware of engineering as a career, to help them achieve the better pass marks necessary in this important subject and to build a larger pool from which engineers can be drawn. Students also benefit from this project by developing a greater sensitivity for serving the community through the training they receive.

Centres and institutes

The Faculty's institutes and centres are financially sound. The tight economic climate currently being experienced worldwide is most probably the reason why the total income of centres and institutes has dropped by 10% to R81,5 million since 2009. An amount of R42 million, almost 52% of the income, was re-invested in the Faculty by the centres and institutes in the form of bursaries to students, research material, equipment, software, books, travel for research purposes, and membership of professional associations, as well as SU levies. From this it is clear that the centres and institutes are a great asset to the Faculty.

Alumni ties strengthened

The Faculty strengthened its ties with former students by holding convivial dinners in Stellenbosch and Sandton for alumni who graduated in 1970 to 1979. On these occasions the Dean, Prof Arnold Schoonwinkel, shared the Faculty's Vision 2020 with the alumni and also appealed to them for financial support. The alumni responded to the appeal enthusiastically and made generous donations to the Dean's Fund.

The year 2010 truly was a good year for the Faculty of Engineering, with many things that worked out well. It has provided a good base for the realisation of Vision 2020.

Die gesellige dinee vir alumni van die sewentigerjare wat op Stellenbosch gehou is.

The convivial dinner held in Stellenbosch for alumni of the seventies.

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PRASA-Leerstoel

Die Passenger Rail Association of South Africa (PRASA) het die Departement Bedryfsingenieurswese in 2009 genader, en gesprekke het gelei tot die ondertekening van 'n ooreenkoms vir die daarstelling van die PRASA/Metrorail leerstoel in Instandhoudingsbestuur. Dit sal vanaf 2011 in die Departement Bedryfsingenieurswese gesetel wees en deur prof Neels Fourie beklee word. Die leerstoel sal navorsing inisieer en uitvoer op die gebied van instandhoudingsbestuur en toepaslike ingenieursbestuurbeginsels wat op die behoeftes van PRASA/Metrorail geskoei is. 'n Formele nagraadse program in Instandhoudingsbestuur sal ook onder die vaandel van die huidige Ingenieursbestuursprogram gevestig word. Die hoofdoel van die nagraadse program is om wetenskaplikes en ingenieurs met die nodige tegniese kundigheid toe te rus en behels beide kursusgebaseerde en navorsingsmeestersgrade asook PhD-grade.

Ter voorbereiding van die PRASA-Leerstoelprojek het Karl Rommelspacher 'n nagraadse beurs vanaf 2010 ontvang. Hy is besig om onder andere verskillende vorme van instandhoudingbestuur na te vors en verskeie Europese instellings te besoek om moontlike samewerkingsnetwerke te identifiseer.

Die aktiwiteite van hierdie nuwe leerstoel sal in 2011 afskop met 'n behoeftebepaling van alle takke van PRASA/Metrorail om bestaande instandhoudingstrategieë en die bedryf daarvan te verbeter. Dit sal opgevolg word met opleiding van middelbestuur op twee vlakke. Die eerste vlak behels werksessies wat sekere geïdentifiseerde opleidingsbehoeftes van personeel aanspreek en waar die klem sal val op vaardighede soos bv. probleemoplossing en tydsbestuur. Die tweede vlak sluit in die aanbied van ongeveer 30 ECSA-geregistreerde kursusse wat ingenieurs en tegnoloë benodig vir die verkryging van CPD-punte vir voortgesette registrasie. Die leerstoel sal ook beurse wat deur Metrorail befonds word, bestuur. 'n Ingenieur sal in 2011 aangestel word om te help met die dryf van die projek.

Nagraadse oplewing

Die twee nagraadse programme in Ingenieursbestuur wat vanaf 2008 aangebied word, se gewildheid handhaaf 'n konstante hoë vlak. Soos in 2009 die geval was, is ongeveer die helfte van die Departement Bedryfsingenieurswese se meestersgraadstudente (37 uit 60) studente in Ingenieursbestuur.

Die afgelope twee jaar was ook uitsonderlik vir die Departement met sewe PhD-grade wat toegeken is in vergelyking met slegs drie die vorige tien jaar. Die Departement hoop om hierdie pas vol te hou aangesien daar verskeie PhD-studente in die pyplyn is met 15 uit die 75 nagraadse studente wat besig is met hul doktorale studie.

'n Bemarkingsinisiatief met groot potensiaal is onderneem toe dr André van der Merwe (voorsitter) en Stephen Matope (PhD-student) nagraadse programme van die Fakulteit Ingenieurswese in Zimbabwe gaan bekendstel het. Hulle het gedurende Mei die National University of Science and Technology (NUST) in Bulawayo besoek. Hul aanslag was tweërlei. Hulle wou eerstens studente aan die universiteit bewusmaak van die breë spektrum magister en doktorale programme wat by die Fakulteit aangebied word. Tweedens wou hulle die dosente daar aanmoedig om hul doktorale studie by die US se Fakulteit Ingenieurswese te kom onderneem aangesien die meeste dosente slegs oor meestersgrade beskik weens die tekort aan hulpbronne vir PhD-studie in Zimbabwe. Hierdie besoek was uiters waardevol. Goeie akademiese kontak is gemaak, en vrugte is reeds opgelewer met 'n hele paar studente wat beplan om in 2011 vir nagraadse studie by die Fakulteit in te skryf.

Prof Neels Fourie is die bekleër van die nuwe PRASA/Metrorail leerstoel in Instandhoudingsbestuur.

Prof Neels Fourie is the incumbent of the new PRASA/Metrorail Chair in Maintenance Management.

PRASA Rail Chair

The Passenger Rail Association of South Africa (PRASA) approached the Department of Industrial Engineering in 2009 and after discussions an agreement was signed for the establishment of the PRASA/Metrorail Chair in Maintenance Management in this Department from 2011. Prof Neels Fourie will be the incumbent. The Chair will initiate and execute research into aspects of maintenance management and applicable engineering management principles best suited to the needs of PRASA/Metrorail. A formal postgraduate programme will also be established under the umbrella of the existing Engineering Management Programme. The primary objective of the postgraduate programme will be to train scientists and engineers to acquire the requisite technical expertise. Both coursework and research-based master's degrees, as well as PhD degrees are offered.

In preparation for the kick-off of the PRASA Rail Chair project, Karl Rommelspacher accepted a postgraduate bursary from the beginning of 2010. Apart from researching different forms of maintenance management, he has visited various European institutions with the aim of identifying possible collaboration networks in Europe.

In 2011 the first task of the new Chair will be to assess the needs at PRASA/Metrorail depots with a view to improving existing maintenance strategies and the operation of these strategies. This will be followed by the training of middle management on two levels. The first level involves workshops that will address identified training needs of personnel, where the emphasis will be on skills such as problem solving and time management. The second level includes the presentation of 30 ECSA-registered courses for CPD of engineers and technicians, as required for continued registration. The Chair will also administer bursaries funded by Metrorail. An engineer will be appointed in 2011 to assist the Chair in driving the project.

Postgraduate programmes popular

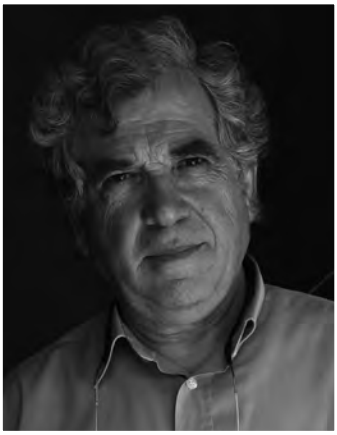
The popularity of the two postgraduate programmes in Engineering Management that were introduced in 2008 remains high. As was the case in 2009, about half of the Department of Industrial Engineering's master's students (37 of the 60) are studying Engineering Management.

The past two-year-period has been an exceptional one for the Department, with seven doctoral degrees being conferred, compared to only three over the previous ten years. The Department hopes to maintain this impetus as there are several PhD students in the pipeline with 15 out of the 75 postgraduate students engaged in their doctoral studies.

A marketing initiative which shows great promise was undertaken by Dr André van der Merwe (Chair) and Stephen Matope (PhD student). In May they visited the National University of Science and Technology (NUST) in Bulawayo, Zimbabwe, to create awareness of the Faculty of Engineering's postgraduate programmes. Firstly, they wanted to make students at NUST aware of the broad spectrum of master's and doctoral degrees offered by the Faculty. Secondly, they wanted to encourage the academic staff at the university to consider PhD studies at Stellenbosch University, as most of the lecturers have only been able to qualify up to master's level due to Zimbabwe's lack of resources at PhD level. Excellent academic contact was made during the visit and this has already borne fruit with several students indicating their intention to register for postgraduate studies at this Faculty in 2011.

Research collaboration award

Prof Dimitri Dimitrov won a THRIP (*Technology and Human Resources for Industry Programme*) award for research collaboration for his work in the field of manufacturing. THRIP, a flagship programme of the National Research Foundation, aims to boost South African industry by



Prof Dimitri Dimitrov het 'n toekenning van THRIP ontvang vir navorsingsamewerking in die vervaardigingsveld.

Prof Dimitri Dimitrov received a THRIP award for research collaboration in the field of manufacturing.

Toekenning vir navorsingsamewerking

Prof Dimitri Dimitrov het 'n toekenning van THRIP (*Technology and Human Resources for Industry Programme*) ontvang vir navorsingsamewerking in vervaardiging. THRIP is 'n vlagskip-projek van die Nasionale Navorsingstigting en fokus daarop om die Suid-Afrikaanse industrie 'n hupstoot te gee deur die ontwikkeling van navorsing en tegnologie, asook deur die gehalte en hoeveelheid van opgeleide mense te vermeerder. Dié toekennings bring die beste Suid-Afrikaanse navorsers, akademici en rolspelers uit die industrie bymekaar in vennootskappe wat deelnemers in staat stel om die gehalte van hul produkte te verbeter. Prof Dimitrov is besig met verskeie projekte op die gebied van vervaardiging en hy het die THRIP-toekenning ontvang vir die THRIP-projek *5-Axis HSC Implementation* wat in 2008 begin is. Vir hierdie projek werk prof Dimitrov saam met ses vennote in die industrie, akademici van die Universiteit van Kaapstad, Universiteit van Johannesburg en die Fraunhofer-instituut vir masjiengereedskap en vormingstegnologie in Duitsland.

Navorsing vir die lugvaartbedryf

'n Projek oor hoë werkverrigting masjinering van ligte metale met die klem op titaan en sekere allooie vorder uitstekend. Vier konsortiumlede, naamlik die Universiteite van Stellenbosch, Johannesburg, en Kaapstad, en die CSIR, asook twee lugvaartbedryfsvennote is hierby betrokke. Die projek het 'n internasionale geur gekry met die Fauenhofer-instituut van Duitsland wat ook aan boord gekom het. Dr Tiaan Oosthuizen, wat op die projek werk, het in 2010 sy doktorsgraad verwerf met sy proefskrif getitel *Wear characterization in milling of Ti6Al4V – A wear map approach*. Sy promotor was dr André van der Merwe en sy medepromotor prof Guvan Akdogan van die Departement Prosesingenieurswese.

OSP-projekte

Die Departement Bedryfsingenieurswese het nes die res van die Fakulteit 'n stewige bydrae gelewer ten opsigte van drie van die Universiteit se OSP-projekte. In die veld van Kommunikasie en Inligtingstelsels word daar o.a. navorsing gedoen op telemedisyne en goeie uitsette is reeds verkry. Die eerste Suid-Afrikaanse Telemedisynekonferensie is in samewerking met die Mediese Navorsingsraad gehou, en Liezl van Dyk was 'n lid van die reëlingskomitee. 'n Kortkursus, *Inleiding tot telemedisynebestuur*, is aangebied en 31 kursusgangers, meestal van provinsiale gesondheidsdepartemente, het dit bygewoon. Op die gebied van Energie en die Omgewing is 'n hele paar navorsingsprojekte onderneem o.a. mikrovervaardiging en mikromateriaalhantering. In die derde veld, Voedselsekerheid, het twee MScIng-studente gradueer. Hul navorsingsonderwerpe het gehandel oor akwakultuur en die boer met roosterhoenders.

Personalia

Corne Schutte wat in Maart 2010 sy doktorsgraad verwerf het, is op 1 November tot medeprofessor bevorder. Sy proefskrif het gehandel oor *Executing innovation projects using the collaborative nature of integrated knowledge networks*. Prof Niek du Preez was prof Schutte se promotor.

Tanya Visser is 1 Mei in die Departement aangestel as lektor. Haar vakgebied is operasionele navorsing en die vakke wat sy op voorgraadse vlak doseer, is ingenieursekonomie en operasionele navorsing. Op nagraadse vlak bied sy modules aan in kwantitatiewe bestuur en gevorderde operasionele navorsing. Mev Visser het haar voorgraadse studie by die Universiteit van Pretoria voltooi en is tans besig met haar doktorsgraad by die Universiteit van Kaapstad.

Dr Tiaan Oosthuizen het sy doktorsgraad in 2010 ontvang en onderneem navorsing vir die lugvaartbedryf op die hoë werkverrigting masjinering en vervorming van titaan.

Dr Tiaan Oosthuizen who obtained his PhD degree in 2010, undertakes research for the aeronautical industry in the field of high performance machining and incremental forming of titanium.

supporting research and technology development, and by enhancing the quality and quantity of appropriately skilled people. It brings together the best of South Africa's researchers, academics and industry players in funding partnerships that enable participants to improve the quality of their products, services and people. Prof Dimitrov is busy with various projects in the field of manufacturing and this THRIP award was for the THRIP project *5-Axis HSC Implementation*. In this project Prof Dimitrov collaborates with six industrial partners, as well as with academics from the University of Cape Town, the University of Johannesburg and the Frauenhofer Institute for Machine Tools and Forming Technology in Germany.

Research for the aeronautical industry

A project on high performance machining of light metals with an emphasis on titanium and selected alloys is in its third year and is progressing well. It is carried out by a consortium comprising the Universities of Stellenbosch, Cape Town, and Johannesburg, the CSIR and two aeronautical companies as industry partners. The project gained an international flavour when the Frauenhofer Institute of Germany also came on board. Dr Tiaan Oosthuizen, who works on the project, obtained his PhD in 2010. His thesis was titled *Wear characterization in milling of Ti6Al4V – A wear map approach*. His promoter was Dr André van der Merwe and his co-promoter was Prof Guvan Akdogan of the Department of Process Engineering.

OSP projects

Like the other departments in the Faculty, this Department delivers a solid contribution towards three OSP projects. In the field of Communication and Information Systems research is done on telemedicine, and excellent results have been obtained so far. The first national Telemedicine conference was held in collaboration with the Medical Research Council and Liezl van Dyk was a member of the organising committee. A total of 31 persons, mostly from provincial health departments, attended the short course *Introduction to Telemedicine Management*. In the field of Energy and the Environment various research projects were undertaken. Two examples are micromanufacturing and micromaterial handling. In the third field, Food Security, two MScEng students graduated with topics in the fields of aquaculture and broiler farming.

Personalia

Corne Schutte who obtained his PhD degree in March 2010, was promoted to the rank of Associate Professor on 1 November. The topic of his dissertation was *Executing innovation projects using the collaborative nature of integrated knowledge networks*. Prof Niek du Preez was Prof Schutte's promoter.

Tanya Visser joined the Department as a lecturer on 1 May. Her field is operational research. She will teach engineering economics and operational research at undergraduate level. At postgraduate level she will present modules on quantitative management and advanced operational management. Mrs Visser completed her undergraduate studies at the University of Pretoria and is currently in the process of completing a PhD at the University of Cape Town.

Tanya Visser is 1 Mei as lektor in die Departement aangestel. Haar vakgebied is operasionele navorsing.

Tanya Visser joined the Department as lecturer on 1 May. Her field is operational research.

Bedryfsingenieurswese is 'n ingenieursdissipline wat fokus op die integrasie en optimale benutting van al die hulpbronne van 'n onderneming (natuurlike hulpbronne, kapitaalhulpbronne en intellektuele hulpbronne) ten einde die onderneming uitnemend te maak. In die moderne samelewing is die vereistes ten opsigte van mededingendheid soveel meer as ooit tevore. Die bedryfsingenieurs van vandag is by uitstek toegerus om oplossings vir hierdie moderne uitdagings te verskaf. Dit word vermag deur hierdie uitdagings te ontleed, oplossings te ontwerp, dit te implementeer en te bedryf.

Die Departement het agt voltydse onderiggewende personeellede, plus ses wat op kontrakbasis onderrig lewer, en is op voorgraadse vlak verantwoordelik vir die program in Bedryfsingenieurswese. Die Departement konsentreer op vier aktiwiteitsareas vir die verbetering van globale mededingendheid:

Strategiese Bedryfsingenieurswese

Dit behels die ingenieurswese van ondernemings as geheel. Hiervoor pas bedryfsingenieurs hul vermoë toe om ondernemings te ontleed, te ontwerp, te implementeer en te bedryf. Strategiese bedryfsingenieurswese sluit velde in soos ondernemingsingenieurswese, kennis- en inligtingsbestuur, finansiële bestuur en tegnologiebestuur.

Stelselingenieurswese

Hierdie rigting behels die toepassing van statistiese en modelleringstegnieke om besluitneming te ondersteun. Hiervoor pas bedryfsingenieurs hul vermoë toe om probleme stelselmatig te modelleer, wetenskaplike tegnieke toe te pas, optima te bepaal en die invloed van veranderings vooruit te skat. Stelselingenieurswese sluit velde in soos teorie van beperkings, stelseldinamika, simulasiemodellering, operasionele navorsing, betroubaarheidsmodellering, analitiese besluitnemingsmodelle, sensitiwiteitsanalise en vooruitskatting.

Toegepaste Bedryfsingenieurswese

Dit behels die toepassing van bedryfsingenieurswese in spesifieke industrieë. Hiervoor pas bedryfsingenieurs hul vermoë toe om te spesialiseer in spesifieke industrieë soos primêre en sekondêre vervaardiging, tegnologie, finansies en dienste. Toegepaste bedryfsingenieurswese sluit velde in soos vervaardigingsprosesse, vervaardigingstelsels, robotika, logistiek, elektronika, metallurgie, mediese tegnologie en dienste.

Ingenieursbestuur

Ingenieursbestuur is die bestuur van tegniese ondernemings of prosesse. Hiervoor pas bedryfsingenieurs hul vermoë toe om die insette van ander dissiplines te koördineer, te integreer en te optimeer. Ingenieursbestuur sluit velde in soos projekbestuur, risikobestuur, kwaliteitsbestuur, prestasiebestuur en doenlikheidstudies in die wyer sin. Meer spesifiek sluit dit egter ook in 'n fokus op die bedryfsprosesse van 'n onderneming. Hiervoor pas bedryfsingenieurs hul vermoë toe om tegniese en nie-tegniese prosesse te ontleed, te herontwerp, te implementeer en te bedryf. Spesifieke areas ter sprake sluit in waarde-ingenieurswese, besigheidsprosesherontwerp, deurlopende verbetering, fasiliteitsbeplanning en ergonomika, met die klem op die bydrae van elke proses tot die strategiese belang van die onderneming.

Instandhoudingsbestuur

Die PRASA-Leerstoel in Instandhoudingsbestuur inisieer en onderneem navorsing op die gebied van instandhoudingsbestuur en toepaslike ingenieursbestuurbeginsels wat op die behoeftes van PRASA/Metrorail geskoei is.

Laboratoria

Die Departement onderhou 'n aantal departementele laboratoria, insluitend:

- Snelprodukontwikkelingslaboratorium
- Twee laboratoria met gevorderde rekenaar- en ontwerpfasiliteite
- Sentrum vir Gevorderde Vervaardiging (SENROB)
- Masjineringslaboratorium
- Mikrovervaardigingslaboratorium
- Metrologie (truwaartse ingenieurswese) laboratorium

Industrial engineering is an engineering discipline that focuses on the integration and optimal utilisation of all of the resources of an enterprise (natural resources, capital resources and intellectual resources) in order to create excellence in the enterprise. In modern society, the requirements towards competitiveness are so much more than ever before. The industrial engineers of today are extremely well-equipped to provide solutions to these modern challenges. These are achieved by analysing the challenges, designing solutions, implementing them and operating them.

The Department has eight full-time positions on its teaching staff, plus six who teach on a contract basis, and at undergraduate level is responsible for the programme in Industrial Engineering. The Department focuses on four areas of activity for improving global competitiveness:

Strategic Industrial Engineering

This area covers the engineering of enterprises as a whole. In order to achieve this, industrial engineers apply their ability to analyse enterprises, design them, implement them and operate them. Strategic industrial engineering includes fields such as enterprise engineering, knowledge and information management, financial management and technology management.

Systems Engineering

This is the application of statistical and modelling techniques to support decision-making. In order to achieve this, industrial engineers apply their ability to model problems systematically, use scientific techniques, determine optima and forecast the effect of changes. Systems engineering includes fields such as theory of constraints, system dynamics, simulation modelling, operations research, reliability modelling, analytical decision-making models, sensitivity analyses and forecasting.

Applied Industrial Engineering

In this area, the application of industrial engineering in specific industries is covered. In order to achieve this, industrial engineers apply their ability to specialise in specific industries such as primary and secondary manufacturing, technology, finance and services. Applied industrial engineering includes fields like manufacturing processes, manufacturing systems, robotics, logistics, electronics, metallurgy, medical technology and services.

Engineering Management

This area covers the management of technical enterprises or processes. In order to achieve this, industrial engineers apply their ability to coordinate, integrate and optimise the inputs of other disciplines. Engineering management includes fields such as project management, risk management, quality management, performance management and feasibility studies in the wider sense. In the short term, it also focuses on the operational processes of a firm. Here engineers apply their ability to analyse technical and non-technical processes, redesign them if necessary, implement and operate them. Specific areas covered here include value-analysis, process re-engineering, continuous improvement, facility planning and ergonomics. Emphasis is placed on the contribution of each process towards the strategic goals of the enterprise.

Maintenance Management

The PRASA Rail Chair initiates and executes research into aspects of maintenance management and applicable engineering management principles best suited to the needs of PRASA/Metrorail.

Laboratories

The Department maintains a number of in-house laboratories, including:

- Rapid Product Development Laboratory
- Two laboratories with advanced computer and CAD facilities
- The Centre for Advanced Manufacturing (SENROB)
- Machining Laboratory
- Micromanufacturing Laboratory
- Metrology (reverse engineering) Laboratory

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Prof Neels Fourie
PRASA Rail Chair: Maintenance management. PROJECT MANAGEMENT: Strategic project management; Programme management; Project risk analysis; Risk management.
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Prof Dimitri Dimitrov
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Prof Corne Schutte
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Departement

ELEKTRIESE & ELEKTRONIESE INGENIEURSWESE

Department of

ELECTRICAL & ELECTRONIC ENGINEERING

Ons studente – ons trots

Studente van die Departement Elektriese en Elektroniese Ingenieurswese (E&E) het in 2010 weer uitsonderlik presteer. Wikus Villet was die wenner van die M-Net Jac van der Merwe Kompetisie vir Innovasie en het hiermee R15 000 ontvang. Hierdie toekenning gaan jaarliks aan die finalejaar met die innoverendste skripsie. Die titel van sy wenprojek was *Intersection violation warning system*. Die ECSA Merietemedalje, wat jaarliks deur die Suid-Afrikaanse Ingenieursraad aan die verdienstelikste finalejaar Matie ingenieurstudent toegeken word, pryk ook op die rak van 'n student van hierdie Departement. 'n Studierekord met 'n gemiddeld van 91,8% oor vier jaar het verseker dat Mark Hans Volkmann die gesogte toekenning dubbel en dwars verdien.

'n Span bestaande uit drie E&E-studente, Ralf Kistner, Dirk-B Coetzee en Reuben Joorst, en 'n student van Prosesingenieurswese, Melissa Munnik, het vir die tweede agtereenvolgende jaar die uitdagende Standard Bank IT Challenge gewen. Hulle het nie net elk 'n skootrekenaar gewen nie, maar het ook R150 000 vir hul Universiteit losgeslaan. Ralf het vroeër die jaar ook sy puik programmeringsvaardighede ingespan en eerste plek in die Google Code Jam Africa Kompetisie verower waartydens hy 212 ander deelnemers uitgestof het. Google Code Jam is 'n programmeringskompetisie waarin professionele programmeerders en studente gevra word om ingewikkelde algoritmiese uitdagings en probleme in 'n baie beperkte tyd op te los. Die Afrika-been van die kompetisie is in 2010 die eerste maal gehou.

Stiaan Gerber, MScIng-student van Johann Strauss, het die eerste prys vir sy referaat, *A finite-element-based optimization tool for linear generators*, ontvang by die South African Universities Power Engineering Conference (SAUPEC) wat by die Universiteit van die Witwatersrand gehou is.

Twee afstammelinge presteer

Twee van die Departement se afwentelmaatskappye is in die verslagjaar met toekennings bekroon. SunSpace en die Departement Elektriese en Elektroniese Ingenieurswese het 'n toekenning van die SABS Ontwerpinstituut ontvang vir die ontwerp van die mikrosatelliet, *SumbandilaSat*. 'n Aantal toekennings word jaarliks in verskeie kategorieë gemaak om uitmuntende produkontwikkeling op die gebied van tegnologie, ingenieurswese en wetenskap wat in Suid-Afrika gedoen is, ten toon te stel. Alhoewel die land op die stadium nie 'n formele ruimteprogram gehad het nie, is die satelliet betyds en binne die begroting voltooi. Dit is bewys van Suid-Afrika se vermoë om selfonderhoudend te wees op die gebied van ruimtewetenskaplike data.

NioCAD (Edms.) Bpk., nog 'n maatskappy wat uit die Departement se navorsing ontstaan het, is aangewys as die wenner in die innovasie-kategorie vir opkomende besighede in die vooraanstaande Technology Top 100 Toekennings (TT100) wat deur die minister van Wetenskap en Tegnologie, Naledi Pandor, oorhandig is. NioCAD het 'n produk, *NioPulse*, ontwikkel wat die wêreld se eerste en enigste geïntegreerde stroombaanontwerpsagteware is wat spesifiek gefokus is op ultrahoëfrekwensie supergeleierstroombane en gemik is op kliënte wêreldwyd. NioCAD is ook aangewys as een van die drie finaliste in die kategorie vir die goeie bestuur van personeel. Die Technology Top 100 Toekennings word al sedert 1990 gemaak en is een van Suid-Afrika se mees vooraanstaande saketoekennings.

Premier besoek MIH-Medialab

Die premier van die Wes-Kaap, Helen Zille, het op 11 Oktober die MIH-Medialab op haar versoek besoek om te kyk hoe nuwe kommunikasietegnologie dienslewering in die provinsie kan verbeter. Sy is verwelkom deur drr Gert-Jan van Rooyen en Herman Engelbrecht, onderskeidelik direkteur en navorsingsbestuurder van die Medialab. Ook teenwoordig was prof Russel Botman (rektor), prof Arnold

Finalejaarstudente wat aan die 2010 M-Net Jac van der Merwe Kompetisie vir Innovasie deelgeneem het, is agter van links Hendrik Odendaal, Stephan Heunis, Wikus Villet (wenner) en Donald van Blommestein. Voor is Juané Brits en Tosca Pistorius.

Final-year students who participated in the 2010 M-Net Jac van der Merwe Competition for Innovation are from the left Hendrik Odendaal, Stephan Heunis, Wikus Villet (winner) and Donald van Blommestein. In the front are Juané Brits and Tosca Pistorius.

Students to be proud of

In 2010 students in the Department of Electrical and Electronic Engineering (E&E) once again gave a good account of themselves. Wikus Villet was the winner of the M-Net Jac van der Merwe Competition for Innovation and received R15 000 as first prize. This award is made annually to the final-year student with the most innovative project. The title of his winning project was *Intersection violation warning system*. Another E&E student, Mark Hans Volkmann, won the ECSA Medal of Merit, an award made annually by the Engineering Council of South Africa to the most deserving final-year Matie engineering student. With an average of 91.8%, he thoroughly deserved this coveted award.

A team comprising three E&E students, Ralf Kistner, Dirk-B Coetzee and Reuben Joorst, and a student from Process Engineering, Melissa Munnik, won the demanding Standard Bank IT Challenge for the second consecutive year. They not only won a laptop each, but Stellenbosch University received R150 000 to boot. Earlier in the year Ralf had used his excellent programming skills to take first place in the Google Code Jam Africa Competition in which 213 professional programmers and students were required to solve complicated algorithmic challenges and problems in a limited time. The Africa leg of this competition was presented for the first time in 2010.

Stiaan Gerber, an MScEng student of Johann Strauss, received first prize for his paper *A finite-element-based optimization tool for linear generators* at the South African Universities Power Engineering Conference (SAUPEC) held at the University of the Witwatersrand.

Two of the Department's offspring win awards

Two spin-out companies of the Department received awards in the report period. SunSpace and the Department of Electrical and Electronic Engineering received an award from the SABS Design Institute for the design of the micro-satellite, *SumbandilaSat*. A number of awards are made in various categories each year to showcase the incredible products in the fields of technology, engineering and science that have been developed in South Africa. Despite the country not having a formal space programme at the time, *SumbandilaSat* was completed on time and within budget and is proof of South Africa's self-sufficiency in space science data resources.

NioCAD (Pty.) Ltd., another company which had its origin in an aspect of the Department's research, was selected as the winner in the innovation category for emerging businesses in the Technology Top 100 Awards (TT100). The award was presented by the Minister of Science and Technology, Naledi Pandor. NioCAD has developed a product, *NioPulse*, which is the world's first and only integrated electronic circuit design software focused specifically on ultra-high frequency superconductive circuits. This product is aimed at a worldwide customer base. NioCAD was also one of three finalists in the category for the management of people. The Technology Top 100 Awards was started in 1990 and is one of South Africa's most prestigious business awards programmes.

Premier visits MIH Media Lab

On 11 October the Premier of the Western Cape, Helen Zille, visited the MIH Media Lab at her request, to see how new communication technology could improve service delivery in the province. She was welcomed by Drs Gert-Jan van Rooyen and Herman Engelbrecht, Media Lab Director and Research Manager respectively. Also present were Prof Russel Botman (Rector), Prof Arnold Schoonwinkel (Dean), Francois Groepe (CEO, Media 24) and Jacques van Niekerk (MIH). During the visit postgraduate students in the Media Lab explained and demonstrated their research to Ms Zille. The Media Laboratory, which is funded by MIH, a division of Naspers, was started in 2008 with the purpose of developing specialist software engineers in the field of web and mobile technologies, generating commercially

Die eg Stellenbosse windgenerator pryk by die SANAE IV-basis op Antarktika.

The wind generator that was manufactured in Stellenbosch proudly stands at the SANAE IV base in Antarctica.

Schoonwinkel (dekaan), Francois Groepe (hoof uitvoerende beampte, Media 24) en Jacques van Niekerk (MIH). Tydens die besoek het nagraadse studente van die Medialab me Zille van hul navorsing vertel en dit ook demonstreer. Die Medialaboratorium, wat befonds word deur MIH, 'n afdeling van Naspers, is in 2008 op die been gebring met die doel om spesialiste met innoverende idees in die veld van web- en mobiele tegnologie op te lei, om intellektuele eiendom met 'n kommersiële waarde te genereer en om tegnologiese entrepreneurskap by jong gegradueerdes aan te moedig.

Navorsing op ys en in die ruimte

Die Departement doen navorsing oor 'n wye spektrum. Twee interessante navorsingsprojekte wat op buitengewone plekke plaasvind, is dié van die mikrosatelliet, *SumbandilaSat*, wat in die ruimte wentel, en die oprigting van 'n windgenerator op Antarktika.

Op 31 Desember 2010 was *SumbandilaSat* alreeds vir 470 dae in 'n 500 km-hoogte wentelbaan om die aarde. Sedert lansering op 17 September 2009 het die satelliet teen einde 2010 reeds 7 149 omwentelings om die aarde gemaak en ongeveer 1 200 hoëresolusiebeelde van die aarde afgelaai. Die beelde word ontvang en verwerk deur die Ruimte Operasies Direktoraat van SANSA (voorheen SAC) by Hartebeesthoek naby Pretoria. Een van die satelliet se groot voordele is dat dit bekostigbare beelde van 'n hoë gehalte kan verskaf. Vir akademiese navorsingsprojekte kan beelde gratis verkry word by http://catalogue.sac.co.za/

Met 3D-brille op, verduidelik Estiaan le Roux sy navorsing aan die premier van die Wes-Kaap, Helen Zille, tydens haar besoek aan die Medialab.

While wearing 3D spectacles, Estiaan le Roux explains his research to the Premier of the Western Cape, Helen Zille, during her visit to the Media Lab.

'n Navorsingsprojek van prof Maarten Kamper wat die verbeelding van menige avonturier aangryp, is die ondersoek na die moontlike benutting van windenergie deur generators op die Suid-Afrikaanse navorsingsbasis (SANAE IV) op Antarktika vir kragvoorsiening vir die basis. Die uiteindelike doel is om drie windturbines met kapasiteit van ongeveer 45 tot 60 kW tesame by die basis op te rig. Vier ingenieurs van die Elektriese Masjienelaboratorium het in Januarie die eerste generator opgerig en het dit vir twee dae krag opgewek. 'n Elektriese fout het egter tot 'n kortsluiting gelei en daar was nie genoeg tyd om dit te herstel voor die span se geskeduleerde vertrek terug nie. Die generator is gelos om te sien of dit storms met windsnelhede van tot 252 km/u op 'n 10 m-hoogte meganies kan oorleef. Die generator sal in 2011 deur 'n nuwe span afgehaal en teruggebring word vir herstel.

Personalia

Prof David Davidson, professor in Numeriese Elektromagnetika in die Departement, is aangestel om 'n SKA-navorsingsleerstoel van die Suid-Afrikaanse Navorsingleerstoel Inisiatief, oftewel die South African Research Chair Initiative (SARChI), van die Departement Wetenskap en Tegnologie en die Nasionale Navorsingstigting, te lei. Die Departement het reeds lank 'n tradisie van uitnemendheid in die opleiding van nagraadse studente in elektromagnetika, radiofrekwensie en mikrogolf ingenieurswese. Die leerstoel sal 'n sterk fokuspunt wees vir toekomstige navorsing op hierdie gebied met veral toepassing op MeerKAT en SKA.

Prof Toit Mouton is vir 'n drie-jaar-termyn verkies tot die Nasionale Navorsingstigting (NNS) se graderingskomitee. Proff Maarten Kamper en Herman Steyn het elk 'n C1-gradering van die NNS ontvang. Prof Steyn is verkies om die voorsitterskap van die Departement vanaf 1 Januarie 2011 oor te neem.

Die uitstekende doserende en navorsingskorps is aangevul met jong bloed met die aanstelling van drie permanente dosente, naamlik dr Dirk de Villiers, Thinus Booysen en Arno Barnard.

Die Departement betreur die tragiese heengaan van een van sy assistente, Henry Arnolds, op 7 Februarie.

useful intellectual property and encouraging technological entrepreneurship as a career option for young graduates.

Research on the ice and in outer space

The research done in the Department covers a wide spectrum. Two interesting research projects that were carried out in unusual places involved the microsatellite, *SumbandilaSat*, which orbits in space, and the erection of a wind generator in Antarctica.

By 31 December 2010 *SumbandilaSat* had already spent 470 days in orbit 500 km above the earth. Since its launch on 17 September 2009, the satellite had completed 7 149 orbits and downloaded approximately 1 200 high-resolution images. The images are received and processed by the Directorate for Space Operations of SANSA (previously SAC) at Hartebeesthoek near Pretoria. One of the satellite's great advantages is the affordable, high-quality images it is able to provide. Images for academic research projects can be obtained free of charge at http://catalogue.sac.co.za/.

A research project of Prof Maarten Kamper's which is sure to capture the imagination of many an adventurer, is the investigation of the possible utilisation of wind energy to power generators at the South African research base in Antarctica (SANAE IV). The eventual aim is to have three wind turbines with a combined output of 45 to 60 kW erected at the base as a source of power for the SANAE network. Four engineers of the Electrical Machines Laboratory erected the first generator in January and successfully managed to generate power for two days. However, a subsequent electrical fault led to a short circuit of the system. Due to the limited time available, it could not be repaired before their scheduled return. The test model was therefore left behind to ascertain whether it could mechanically withstand storms with wind speeds of up to 252 km/h at a height of 10 m. The generator will be dismantled by a new team in 2011 and brought back for repair.

Personalia

Prof David Davidson, Professor in Computational Electromagnetics in the Department, was appointed to the SARChI SKA Research Chair, sponsored by the South African Research Chair Initiative (SARChI) of the Department of Science and Technology and the National Research Foundation. The Department has a long tradition of excellence in training postgraduate students in electromagnetics, radio-frequency and microwave engineering, and this Chair will provide a strong focus for future research in this field, with particular relevance to MeerKAT and the SKA.

Prof Toit Mouton was elected to serve on the rating committee of the National Research Foundation (NRF) for three years. Profs Maarten Kamper and Herman Steyn both received a rating of C1 from the NRF. Prof Steyn was elected to take up the position of Chair in the Department from 1 January 2011.

The excellent lecturing and research corps of the Department received an injection of young blood with the appointment of Dr Dirk de Villiers, Thinus Booysen and Arno Barnard as permanent lecturers.

The Department was deeply saddened by the tragic death of one of its assistants, Henry Arnolds, on 7 February.

Drie jong dosente wat by die Departement aangesluit het, is van links dr Dirk de Villiers, Thinus Booysen en Arno Barnard.

Three young lecturers who joined the Department are from the left Dr Dirk de Villiers, Thinus Booysen and Arno Barnard.

Die Departement het 28 permanente onderrigposte, 198 nagraadse studente en meer as 400 voorgraadse studente en is een van die grootste departemente in die Fakulteit. Sy personeel is uitstekend gekwalifiseer – 21 van sy permanente dosente het doktorsgrade. Met sy vier afdelings weerspieël die Departement se organisatoriese struktuur sy navorsings- en onderrigfokus op die vyf hoofrigtings van elektriese en elektroniese ingenieurswese.

Rekenaars en Beheer

In die Elektroniese Stelselslaboratorium (ESL) word veral navorsing, ontwikkeling en projekte gedoen op die beheer van platforms in afstandwaarneming toepassings, hierdie sluit in satelliete (bv. Cubesats) (sien nota), bemande en onbemande vliegtuie en lugskepe (UAVs) asook onbemande duikbote (AUVs). Aangesien die meeste navorsing deel vorm van 'n groter stelsel, word studente ook blootgestel aan die volle omvang van bestuurs- en tegniese take wat die ontwikkeling van sulke ingewikkelde stelsels vereis. (Nota: Die SUNSAT-mikrosatelliet wat binne die ESL ontwikkel is, het suksesvol vir twee jaar unieke aardwaarneming- en kommunikasiegeleenthede aan Suid-Afrika verskaf.)

Elektriese Energie

Hierdie Afdeling fokus sterk op drywingselektronika vir aanpasbare wisselstroom transmissiestelsels en elektriese aandrywing, elektriese masjiene en kragstelsels. Die fasiliteite sluit gevorderde instrumentasie vir stelselsidentifikasie en die ontwerp van elektrisiteitsverspreidingstelsels in. Boonop huisves die Departement die enigste Hoogspanningslaboratorium in die Wes-Kaap, sowel as die Elektriese Masjienelaboratorium waar, onder andere, die ontwerp en toets van 'n nuwe soort windgenerator en 'n "groen" elektriese voertuig tans plaasvind.

Elektronika en Elektromagnetika

Huidige aktiwiteite fokus op die volgende: RF en mikrogolf antennes vir kommunikasie en radarstelsels, FEM, FDTD en MoM modellering van antennes en golf voortplanting in komplekse elektromagnetiese omgewings, FEM sagteware ontwikkeling, golf voortplanting in die atmosfeer en geologiese formasies, vrye-ruimte en naby-veld metingstegnieke, die Karoo Array Telescope (KAT) en die Square Kilometre Array (SKA). Ander navorsingstemas is: Supergeleierelemente, elektromagnetiese versoenbaarheid, boorgatradar, mikrogolffilters en nie-lineêre stroombane. 'n Antenne- en mikrogolflaboarorium, ondersteun deur gesofistikeerde instrumentasie en kragtige rekenaarfasiliteite, verskaf die infrastruktuur vir navorsing.

Seinverwerking en Telekommunikasie

Hierdie groep werk op 'n verskeidenheid gebiede wat die manipulasie van inligtingdraende seine behels. Dit bestaan daaruit om inligting daaruit te onttrek of in te bed (digitale seinprosessering), die transmissie van sodanige seine oor lang afstande (telekommunikasie) en deur middel van komplekse netwerke (kommunikasienetwerke), en die outomatiese leer en herkenning van die seininhoud (masjienleer) met spesifieke klem op spraak- en beeldseine.

The Department has 28 permanent teaching positions, 198 postgraduate students and more than 400 undergraduate students, and is one of the largest departments in the Faculty. The Department has highly qualified staff – 21 of its permanent lecturers hold doctoral degrees. With its four divisions, the organisational structure of the Department reflects its research and teaching focus on the five main areas of electrical and electronic engineering.

Computers and Control Systems

In the Electronic Systems Laboratory (ESL), research, development and projects concentrate mainly on the control of remote sensing platforms. These platforms include satellites (e.g. Cubesats) (see note), manned and unmanned aerial vehicles (UAVs) as well as autonomous underwater vehicles (AUVs). As most of the research is done as part of a larger system, students are exposed to the full breadth of the management and technical activities required in complex system development. (Note: The SUNSAT microsatellite, developed within the ESL, provided unique earth observation and communication opportunities for South Africa for two years.)

Electrical Energy

The Energy Division has a strong focus on power electronics device applications and electric drives, electric machines and power systems. Facilities include three large, world-class laboratories for research on high-voltage, power electronics (including advanced instrumentation for system identification and reticulation design) and electrical machines. The Department houses the only High-Voltage Laboratory in the Western Cape, and the Electrical Machines Laboratory where recently, among other things, a novel wind generator and a "green" electric car were developed and tested.

Electronics and Electromagnetics

Current activities focus on the following projects: RF and microwave antennas for communications and radar systems, FEM, FDTD and MoM modelling of antennas and wave propagation in complex electromagnetic environments; FEM software development, wave propagation in the atmosphere and geological formations, free-space and near-field measurement techniques, the Karoo Array Telescope (KAT) and the Square Kilometre Array (SKA). Other activities include superconducting elements, electromagnetic compatibility, borehole radar, microwave filters and non-linear circuits. An antenna and microwave laboratory, supported by sophisticated instrumentation and powerful computing facilities, provides the infrastructure for research work.

Signal Processing and Telecommunication

This group works in a variety of areas that involve the manipulation of information-bearing signals. This comprises both extracting and embedding information in the signal (digital signal processing), the transmission of such signals over large distances (telecommunication) and through complex networks (communication networks), and the automatic learning and recognition of the signal content (machine learning) with particular focus on speech and image signals.

Rekenaars en Beheer • Computers and Control Systems

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Elektronika en Elektromagnetika • Electronics and Electromagnetics

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Seinverwerking • Signal Processing

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Departement

MEGANIESE & MEGATRONIESE INGENIEURSWESE

Department of

MECHANICAL & MECHATRONIC ENGINEERING

Studente presteer

Een van die grootste belonings vir akademici is seker wanneer hul studente as wenners triomfeer in kompetisies waarin hulle teen hul eweknieë van ander universiteite meeding. Studente van die Departement Meganiese en Megatroniese Ingenieurswese het vir die derde agtereenvolgende jaar die PneuDrive Challenge gewen; iets waarop die Departement voorwaar trots is. Dié ontwerpkompetisie, wat deur SEW Eurodrive en Festo geborg word, beloon innovasie op die gebied van megatroniese ontwerp. Die Matie wenspan, Ivan Deetlefs, Thabo Mofokeng, Ryan du Plessis en Alex Oelofse, het die beoordelaars beïndruk met hul ontwerp vir die *Tshabalala Soccer Ball Shooting Machine*. Hul masjien simuleer "set-piece" oefening en kan ook lukrake en onvoorspelbare skoppe na die doelhok genereer wat buiteveldspelers help om hul oefentyd tot die maksimum te benut en die doeltreffendheid van die doelwagteropleiding te verhoog. Die span het gewerk onder die vaardige leiding van prof Anton Basson wat ook die vorige twee spanne gelei het. Die spanlede het 'n geborgde besoek aan Duitsland gewen asook toerusting van SEW Eurodrive en Festo ter waarde van R100 000 vir hul Departement.

Dawie van den Heever, 'n megatroniese ingenieurswese PhD-student van prof Cornie Scheffer, het met sy produk, *uMove,* derde geëindig in die Innovasiefonds se nasionale sakeplankompetisie vir studente. Dit behels 'n knievervangingsprostese wat vir elke individuele pasiënt pasgemaak word. Studente van Suid-Afrikaanse hoër-onderwysinstellings mag aan die kompetisie deelneem wat vereis dat deelnemers 'n sakeplan vir 'n nuwe produk moet opstel. Knievervangings is deesdae algemeen (jaarliks meer as 600 000 wêreldwyd) en word gedoen wanneer erge degenerasie van die knie voorkom. Die geometrie van elke individu is uniek en dus kan konvensionele knievervangings nie altyd die normale kniebeweging herstel nie, omdat die meeste konvensionele kniegewrigprosteses slegs in standaardvorme en groottes voorkom. *uMove* is baseer op rekenaartomografiedata van die pasiënt se kniegewrig en poog om die oorspronklike artikulerende oppervlaktes te herstel om sodoende weer die oorspronklike kniebeweging te kan terugkry. Die R150 000 prysgeld wat Dawie ontvang het, word aangewend vir verdere navorsing, ontwikkeling en kommersialisering van die produk.

Die wenspan in die PneuDrive Challenge is agter van links Ivan Deetlefs, Ryan du Plessis en Alex Oelofse. Voor is Thabo Mofokeng.

The winning PneuDrive Challenge team. Back from the left are Ivan Deetlefs, Ryan du Plessis and Alex Oelofse. Front is Thabo Mofokeng.

Goeie verhoudinge baan die weg vir goeie toerusting

Goeie verhoudinge wat oor jare met die industrie opgebou is, het vrugte afgewerp in die vorm van noodsaaklike toerusting vir onderrig en navorsing op die gebied van biobrandstowwe wat van twee maatskappye ontvang is. Die Ford Enjinaanleg in Port Elizabeth het 'n 1,6-liter RoCam-enjin en onderdele ter waarde van R24 000 aan die Departement geskenk om infrastruktuur te skep waar studente meer te wete kan kom van die meganika, metallurgie en termodinamika van enjins asook die verbrandings- en hittevrystellingseienskappe van biobrandstowwe. Richard Haines se jarelange ervaring op die gebied van binnebrandenjins en goeie verhoudinge wat hy oor jare met die industrie opgebou het, het Sasol ook aangespoor om waardevolle toerusting op permanente basis aan die Departement se enjintoetsfasiliteit te leen. Die enjindinamometers en beheerders, asook toerusting om uitlaatgasse van voertuie te ontleed, sal van groot nut wees vir nagraadse studie en tweede generasie biobrandstofnavorsing.

Groep lewer bydrae op gebied van kernkragveiligheid

Die Kernkragveiligheidsgroep het vier referate gelewer by die vyfde Hoëtemperatuur Reaktorkonferensie in Praag in Oktober. Die groep is op die been gebring om te fokus

Students excel

One of the greatest rewards for academics is surely when their students triumph in competitions against their peers from other universities. Students from the Department of Mechanical and Mechatronic Engineering took the top spot in the PneuDrive Challenge for the third year running; an achievement which makes this Department very proud indeed. This design competition, sponsored by SEW Eurodrive and Festo, rewards innovation in mechatronic design. The Matie winning team, comprising Ivan Deetlefs, Thabo Mofokeng, Ryan du Plessis and Alex Oelofse, impressed the judges with their design for the *Tshabalala Soccer Ball Shooting Machine*. Their machine can simulate set-piece training as well as generate random and unpredictable kicks at goal, which helps teams to maximise the training time of outfield players and heightens the effectiveness of goalkeeper training. The team worked under the capable leadership of Prof Anton Basson, who led the two previous Stellenbosch teams to victory. As first prize they received an all expenses paid trip to Germany as well as R100 000 worth of SEW Eurodrive and Festo equipment for their Department.

Dawie van den Heever, a PhD mechatronic engineering student of Prof Cornie Scheffer, was placed third in the Innovation Fund's National Student Business Plan Competition. Students from South African Institutions of Higher Education may enter and must submit a business plan for a new product. Knee replacement surgery is a common procedure performed when severe degeneration of the knee is present, with more than 600 000 knee replacement surgeries currently being performed world-wide every year. Every individual's knee geometry is unique, and conventional knee replacements cannot always restore the natural range of movement of the knee, as most of the current conventional knee joint prostheses are available only in standard shapes and sizes, pre-determined by the manufacturer. Dawie's product, *uMove*, is a knee prosthesis that is custom-made for each individual patient. The *uMove* unicompartmental knee replacement is based on data obtained by computer tomography of the patient's knee joint and its aim is to restore the original articulating surfaces, thus restoring the original knee function. His R150 000 prize money will be used for further research and development as well as commercialisation of the product.

Good relations bear fruit

Good relations with industry, maintained over time, bore fruit when essential equipment needed for tuition and research in the field of biofuels was received from two companies. The Ford Engine Plant in Port Elizabeth donated a RoCam engine and components to the Faculty of Engineering in order to advance research in biofuels and sustainable energy sources. The donation of a complete 1,6-litre RoCam engine assembly, along with three cylinder head assemblies with a combined value of approximately R24 000, will assist the Faculty in establishing an infra-structure where students can learn more about the mechanics, metallurgy and thermodynamics of engines, as well as the combustion and heat release properties of biofuels. Richard Haines' invaluable experience in the field of internal combustion engines and his good relationship with industry inspired Sasol to give exceptionally useful equipment to the Department on permanent loan to be used in the engine testing facility. The engine dyna-mometers, controllers, as well as an automotive exhaust gas analyser, will be of great value in postgraduate studies and second generation biofuel research.

Group contributes towards nuclear safety

The Nuclear Safety Engineering group presented four papers at the 5th High Temperature Reactor Conference in Prague in October. The group was formed to meet the new-technology development needs of the "Nuclear Renaissance" the world is experiencing as a result of the so-called liquid-fuel crisis and the need for improved

Dawie van den Heever vertoon sy produk, uMove.

Dawie van den Heever demonstrates his product, uMove.

op die ontwikkeling van nuwe tegnologie vir die "kernkrag Renaissance" wat die wêreld tans ondervind as gevolg van die tekort aan vloeibare brandstof. Ongeveer 189 referate is deur verteenwoordigers van 29 lande gelewer.

Eksterne oorsig oor sentrum positief

'n Eksterne oorsig van die Sentrum vir Hernubare en Volhoubare Energiestudies is in 2010 op versoek van die sentrumbestuur gedoen. Die oorsig het die periode Januarie 2007 tot Desember 2009 gedek. Aspekte waaraan aandag gegee is, sluit in die beursprogram, kursuswerk vir die magisterprogram, navorsingsprojekte, koördinering tussen die "speke" van die sentrum, openbare bewusmakingsaktiwiteite, bestuur en finansiële verslagdoening, en toekomstige strategiese doelwitte. Die oorsigkomitee het SANERI gelukgewens met die daarstelling van die Sentrum. Voorts het die komitee ook die sentrumbestuur op die skouer geklop vir die suksesvolle wyse waarop die Sentrum die afgelope vier jaar bedryf is. In die lig van die beskikbaarheid van uitstekende son-energie en ander hernubare energiebronne in Suid Afrika, behoort die aktiwiteite van die Sentrum voortgesit én versterk te word wat bykomende befondsing sal vereis.

Personalia

'n Groot gees in die Departement, prof Detlev Kröger, het einde 2010 na 43 jaar as akademikus en navorser in die Departement afgetree. Sy bydrae om energie-omsetting meer doeltreffend te maak, en die omgewingsimpak van elektrisiteitsopwekking te verminder, is feitlik onberekenbaar. Sy navorsing se trefwydte is werklik uitsonderlik: vanaf basiese ondersoeke van fisiese verskynsels in warmteruilers, tot die rekenaarsimulasies van groot verkoelingstelsels in atmosferiese omstandighede, na die toepassing van sy navorsing op die grootste kragstasies ter wêreld. Prof Kröger word wêreldwyd gereken as dié spesialis in beide lugverkoelde warmteruilers en nat koeltorings, en sy navorsing is tans ongeëwenaar op albei hierdie gebiede. Sy boek, *Air-Cooled Heat Exchangers and Cooling Towers (Vol 1 & 2)*, word beskou as dié verwysingswerk oor die onderwerp en is bekroon met die Bill Venter/Altron literêre toekenning. Hy is die enigste A-gragradeerde navorser by die Fakulteit soos bepaal deur die Nasionale Navorsingstigting.

Paul Gauché is 1 Januarie aangestel as senior navorser in 'n pos wat deur Sasol geborg word. Hy sal hom toespits op navorsing op die gebied van son-termiese-energie.

Hanno Reuter en Cobus Müller het hul doktorsgrade ontvang. Die titel van hul onderskeie proefskrifte was *Performance evaluation of natural draught cooling towers with anisotropic fills* en *Modelling subject-specific patellofemoral joint dynamics*. Dr Reuter se promotor was prof Detlev Kröger, en dr Müller s'n was prof Cornie Scheffer.

Kobus van der Westhuizen wat veertien jaar by die Departement was, het die akademie verlaat om 'n opwindende geleentheid in die privaatsektor op die gebied van ruimte ingenieurswese aan te gryp.

Prof Gerrie Thiart, 'n lid van die Termovloei Afdeling, is op 13 September 2010 oorlede. Hy was sedert 1991 werksaam in dié Departement en het ook vir 'n paar jaar by die Militêre Akademie in Saldanha klasgegee, waarna hy in 2007 na die Departement teruggekeer het. Hy sal onthou word vir sy deeglikheid, uitstekende vordering in die akademie, toegewydheid en die soliede bydrae wat hy gelewer het.

Die Kernkragveiligheidsgroep tydens hul besoek in Praag. Van links is Elbrecht Oswald, Herman Steyn, Robert Dobson, Louis Rossouw en Aldo Verwey.

The Nuclear Safety group during their visit to Prague are from the left Elbrecht Oswald, Herman Steyn, Robert Dobson, Louis Rossouw and Aldo Verwey.

Generation IV reactor technology. In total some 189 papers were presented by representatives from 29 countries.

External review of CRSES positive

An external review of the Centre for Renewable and Sustainable Energy Studies (CRSES) was commissioned in 2010 to implement a decision taken by the Management Board of the Centre. The review covered the period January 2007 to December 2009. Aspects that received attention were the bursary programme, the coursework master's programme, research projects, coordination of the spokes in renewable energy, public awareness activities, management and financial reporting structure, and future strategic goals. The Review Committee congratulated SANERI for having initiated the activities. It also congratulated the team of CRSES for the successful way the Centre has operated over the past four years. The Committee recommended that in view of the vast solar energy and other renewable energy resources available in South Africa, the activities of CRSES should continue and be further extended which will require additional funding.

Personalia

A living legend in the Department, Prof Detlev Kröger, retired at the end of 2010 after 43 years as an academic and researcher. His contribution in the field of optimising energy transfer, resulting in reducing the environmental impact of electricity generation, is immeasurable. The scope of his research is truly exceptional: from basic studies of physical phenomena in heat exchangers, to computer simulations in atmospheric conditions as well as research applied to the largest power stations in the world.

Prof Kröger is regarded as the worldwide specialist in both air-cooled heat exchangers and wet cooling towers and his research is currently unequalled. His book *Air-Cooled Heat Exchangers and Cooling Towers (Vol 1 & 2)* is regarded as *the* reference regarding this subject for which he received the Bill Venter/Altron literary award. He is the only National Research Foundation A-rated researcher at the Faculty of Engineering.

Paul Gauché was appointed as senior researcher on 1 January in a post sponsored by Sasol. He will focus on research in the field of solar thermal energy.

Hanno Reuter and Cobus Müller both received their doctoral degrees. The titles of their dissertations were, respectively, *Performance evaluation of natural draught cooling towers with anisotropic fills* and *Modelling subject-specific patellofemoral joint dynamics*. Dr Reuter's promoter was Prof Detlev Kröger while Prof Cornie Scheffer was Dr Müller's promoter.

Kobus van der Westhuizen, who served in this Department for fourteen years, exchanged academic life for an exciting new opportunity in aeronautical engineering.

Prof Gerrie Thiart, a member of the Thermo-fluids Division, sadly passed away on 13 December 2010. He joined the Faculty of Engineering in 1991 and also lectured at the Military Academy in Saldanha for a period, after which he returned to this Department. He will be remembered for his thoroughness, excellent academic progress, dedication and his solid contribution.

Van links is dr Hanno Reuter wat sy doktorsgraad verwerf het, Regine Kröger en prof Detlev Kröger, wat na 43 jaar uitmuntende diens afgetree het.

From the left are Dr Hanno Reuter who obtained his PhD degree, Regine Kröger, and Prof Detlev Kröger who retired after 43 years' exceptional service.

Die Departement het 22 dosente (15 met doktorsgrade), drie senior navorsers, 121 nagraadse studente en is aktief in die volgende navorsingsgebiede:

Strukture en Optimering

Ontwikkel gevorderde optimeringsalgoritmes, met toepassing in o.a. strukture; Ondersoek natuurlike frekwensies, sterkte en leeftyd van meganiese strukture d.m.v. analitiese en numeriese metodes (FEA), laboratoriumtoetse en veldmetings.

Materiale

Poeiermetallurgie-prosesse en -produkte, gefokus op titaan en sy allooie; Nanoporeuse en gestruktureerde PGM (platinum groep metale) allooie; Kontinue veselversterkte termoset saamgestelde materiale vir lugvaart komponente en strukture; Falingsgedrag van saamgestelde materiale.

Klank, Vibrasie en Dinamika

Menslike reaksie op hand-arm en heel-liggaam vibrasie; Dinamiese sitplek karakterisering; Beoordeel van klank-gehalte; Modelleer en simulasie van dinamiese stelselgedrag in toepassings soos vlugmeganika, treine, satelliete en ritgemak van voertuie.

Meganiese en Megatroniese Ontwerp, Outomatisasie

Ontwerp van megatroniese stelsels, insluitend masjienvisie en geoutomatiseerde vervaardiging; Kommunikasiesteun vir verspreide ontwerpspanne; Truwaartse ingenieurswese; Mikrometrologie.

Modellering van Korrelrige Vloei

Numeriese modelle (diskrete-element- en kontinuummetodes) van die beweging van korrelrige materiale, toegepas op o.a. mynbou- en grondverskuiwingstoerusting, partikel dempers, voerbande, ens.

Biomediese Megatronika

Mediese instrumente met die minimum inbreuk vir die meet van mediese parameters; Pasgemaakte oplossings vir die behandeling van spesifieke siektetoestande; Biomediese megatroniese instrumente vir telemedisyne; Mediese sensore vir *in vivo* toetsing van knie biomeganiese eienskappe.

Energie en Omgewing

In samewerking met die Sentrum vir Hernubare en Volhoubare Energie; Hernieubare energievoorsiening, veral konsentreerde son-termiese krag- en energiestoorstelsels; Toetse op waaiers, warmteruilers en koeltoringpakkings volgens internasionale standaarde; Wêreldleier navorsing op lugverkoelde warmteoordraers en koeltorings; Modellering van industriële verkoelingstelsels; Termodinamiese kringlope ontwikkeling.

Turbomasjinerie

Ontwikkeling van spesiale waaiers, kompressors en turbines, bv. vir seestroom-, wind- en son-energiebenutting, en vir lugverkoelde stelsels.

Marine Ingenieurswese

Energiedoeltreffende skeepsaandrywing en rompontwerp; Sleeptenk-, kavitasietonnel- en hersirkulasietenk toetswerk.

Tweefase Vloei

Tweefase vloei en -warmteoordrag; Hittepype en ander tweefase vloei en warmteoordrag toestelle; Volhoubare termiese- en energiebestuur; Temperatuur beheer d.m.v. natuurlike sirkulasie-lusse.

Berekeningsvloeidinamika

Modelleer termovloei-verskynsels, bv. tweefase atmosferiese partikelvloei; Binnebrand- en ander enjins; Atmosferiese omgewing rondom koeltorings en sonskoorsteenkragstasies; Waaiers en hul omgewing; Vloei rondom skeepskomponente; Biomediese toepassings.

Enjintoetse van Biobrandstowwe en Mengsels

Enjintoetse van biobrandstowwe en mengsels in kompressieontsteking- en vonkontsteking-enjins op dinamometertoetsfasiliteite; Bepaling van enjinprestasie, uitlaat-emissies, verbrandingskwaliteit en hitte vrystelling.

Kernkragingenieurswese

Passiewe en natuurlike konveksie verkoeling van reaktorstelsels; Reaktor-oorskothitte herwinning- en gebruikstelsels.

The Department has 22 lecturers (15 with doctoral degrees), three senior researchers, and 121 postgraduate students. The Department is active in the following research areas:

Structures and Optimisation

Develop advanced optimisation algorithms, including applications in structures; Examining natural frequencies; Strength and durability of mechanical structures are determined using analytical and numerical methods (FEM), laboratory tests and field measurements.

Materials

Powder metal processing and products, focusing on titanium and its alloys; Nanoporous and structured PGM (platinum group metals) alloys; Continuous fibre-reinforced thermoset composites for aviation components and structures; Composite material failure phenomena.

Sound, Vibration and Dynamics

Human reaction to hand-arm and whole-body vibration; Dynamic seat test characterisation; Evaluating sound quality; Modelling and simulation of dynamic system behaviour in applications such as flight mechanics, trains, satellites and riding comfort of vehicles.

Mechanical and Mechatronic Design, Automation

Mechatronic system design, including machine vision and automated manufacturing; Communication support for distributed design teams; Reverse engineering; Micrometrology.

Granular Flow Modelling

Numerical models (discrete element and continuum methods) of the motion of granular materials, applied to mining and earthmoving equipment, particle dampers, conveyors, etc.

Biomedical Mechatronics

Minimally invasive devices to collect healthcare information: Customised solutions for the treatment of specific diseases; Biomedical mechatronic devices for telemedicine; Medical sensors for *in vivo* testing of human knee biomechanical properties.

Energy and Environment

In collaboration with the Centre for Renewable and Sustainable Energy Studies; Renewable energy provision, particularly concentrated solar-thermal power and energy storage systems; Testing fans, heat exchangers and cooling tower fills to international test standards; World leading research in air-cooled heat exchangers and cooling towers; Modelling of industrial cooling systems; Thermodynamic cycle development.

Turbomachinery

Development of special fans, compressors and turbines, e.g. for ocean current, wind, and solar energy exploitation, and for air-cooled systems.

Marine Engineering

Energy efficient ship propulsion, and hull design; Towing tank, cavitation tunnel and recirculation tank testing.

Two-phase Flow

Two-phase flow and heat transfer; Heat pipes and other two-phase flow and heat transfer devices; Sustainable thermal and energy management; Temperature control using natural circulation loops.

Computational Fluid Dynamics

Modelling thermo-fluid phenomena e.g. two-phase atmospheric particle flow; Internal combustion and other engines; The atmospheric environment around cooling towers and solar chimney power stations; Fans and their environment; Flow around ship components; Biomedical applications.

Engine Testing of Biofuels and Blends

Engine tests of biofuels and blends in compression-ignition and spark-ignition engines on dynamometer test stands; Determination of engine performance, exhaust gas emissions, combustion quality and heat release.

Nuclear Engineering

Passive and natural convection cooling of reactor systems; Reactor waste heat recovery and utilisation systems.

Meganika • Mechanics

Prof Gerhard Venter
COMPUTATIONAL MECHANICS: Structural analysis and optimisation; Multidisciplinary optimisation.
gventer@sun.ac.za

Prof Albert Groenwold
COMPUTATIONAL MECHANICS: Structural analysis and optimisation; Finite element techniques.
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Dr Deborah Blaine
MATERIALS ENGINEERING: Powder and particulate materials; Characterisation of material properties; Material development.
dcblaine@sun.ac.za

Mr Sa-aadat Parker
COMPOSITE MATERIAL STRUCTURES: Composite materials; Structures.
saparker@sun.ac.za

Prof Wikus van Niekerk
CENTRE FOR RENEWABLE AND SUSTAINABLE ENERGY STUDIES: Postgraduate studies in renewable and sustainable energy. SOUND AND VIBRATION: Automotive NVH; Human response to sound and vibration; Sound quality; Vibration measurement, analysis and control. DYNAMICS: Modelling and simulation of vehicle dynamics.
wikus@sun.ac.za

Ontwerp en Megatronika • Design and Mechatronics

Prof Anton Basson
MECHANICAL AND MECHATRONIC DESIGN: Design for manufacturing; Distributed design; Automation.
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Prof Cornie Scheffer
MECHATRONIC DEVICES: Biomedical engineering; Mechanical design; Vibration analysis; Neural networks.
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Prof Kristiaan Schreve
MECHANICAL DESIGN: Micrometrology; Machine vision; Reverse engineering; Rapid prototyping.
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Dr Corné Coetzee
MODELLING OF GRANULAR FLOWS: Meshless finite elements and discrete element method.
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Dr Danie Els
MECHANICAL DESIGN: Design; Systems engineering and design optimisation; Modelling of granular flows and particle dampers; Infantry weapon systems and fuze design.
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Dr Yoonsoo Kim
COORDINATED CONTROL FOR MULTI-AGENT SYSTEMS: Linear and non-linear control theory; Convex optimisation; Distributed systems; Robot soccer.
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Dr Cobus Müller
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Mr Piero Trinchero
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Termovloei • Thermo-fluids

Prof Thomas Harms
ENERGY SYSTEMS: Computational fluid dynamics; Renewable energy.
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Prof Christiaan Meyer
MULTIPHASE FLOWS: Mineral processing; Particulate dispersion and suspension; Non-Newtonian behaviour of multiphase fluids; Combustion.
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Prof Theo von Backström
TURBOMACHINERY: Fan design; Solar thermal energy systems; Fluid mechanics; Ocean energy.
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Dr Ben Sebitosi
THERMO-FLUID DYNAMICS: Solar energy applications; Photovoltaics; Energy conservation and policy.
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Mr Robert Dobson
HEAT TRANSFER: Two-phase flow and heat transfer; Heat pipes and other two-phase flow and heat transfer devices; Sustainable thermal and energy management and temperature control using natural circulation.
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Mr Paul Gauché
SOLAR THERMAL ENERGY: Concentrating Solar Power (CSP) systems modelling; Technology readiness; Optics; Thermodynamics; Heat transfer and fluid mechanics.
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Mr Richard Haines
INTERNAL COMBUSTION ENGINES: Compression-ignition and spark-ignition engine performance evaluations of biofuels and blends.
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Dr Hanno Reuter
THERMODYNAMICS, FLUID DYNAMICS AND HEAT TRANSFER: Performance evaluation and optimisation of industrial cooling towers and air-cooled heat exchangers.
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Mr Johan van der Spuy
FLUID MECHANICS AND TURBOMACHINERY: Fluid mechanics; Turbomachinery design; Axial flow fan development.
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Mrs Dimitra Westdyk
THERMODYNAMICS: Air conditioning; Refrigeration; Thermodynamics and heat transfer.
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Departement
PROSESINGENIEURSWESE

Department of
PROCESS ENGINEERING

Prosesingenieurswese lewer topstudent

Die Departement Prosesingenieurswese het 'n trotse oomblik beleef toe sy student dr Lidia Auret, wat in Desember haar doktorsgraad ontvang het, by dieselfde geleentheid ook aangewys is as die ontvanger van die Kanseliersmedalje. Haar uitmuntende studierekord het aan haar hierdie erkenning as Universiteit Stellenbosch se topstudent vir 2010 besorg. Sy het in haar voorgraadse studieloopbaan 'n gemiddeld van 87,8% gehandhaaf en haar meestergraad is weens die hoë gehalte daarvan na 'n PhD opgradeer. Die titel van dr Auret se proefskrif was *Process monitoring and fault diagnosis using random forests* en haar promotor was prof Chris Aldrich. Dr Auret sal in 2011 haar nadoktorale studie voortsit met 'n genootskap van die Claude Leonstigting.

Vroue in ingenieurswese

Chemiese Ingenieurswese is 'n gewilde rigting vir veral vroue en ongeveer 36% van dié Departement se studente behoort aan die skoner geslag. Prosesingenieurswese is daarom goed verteenwoordig by die jaarlikse SAWomEng konferensie wat ten doel het om vroue vir die ingenieursberoep te behou. Analene Beyers, Nadia Church en Megan van Ster het saam met 67 ander vroue-studente van oor die land tydens die konferensie sosiale en ingenieursprobleme bespreek. Daar was ook ruim geleentheid vir die uitruil van kennis en ervaring tussen die jong vroue wat op die drumpel van hul loopbaan as ingenieurs staan en verteenwoordigers van industrie, die staat en die akademie.

Toekenning vir bioprosesseringsgroep

'n Toekenning van die Departement Handel en Nywerheid het die Bioprosesseringsgroep, met prof Johann Görgens aan die stuur, te beurt geval. Hierdie groep fokus op die vervaardiging van bio-energie uit hernieubare bronne asook die vervaardiging van industriële ensieme. Bio-energie word wyd erken as een van die vernaamste alternatiewe in die verskaffing van hernieubare en volhoubare energie. Die groep se navorsing sluit in die vervaardiging van bio-etanol (verkry uit lignosellulosiese plantmateriaal) vir vervoerdoeleindes. Daar is goeie samewerking met planttelers vir nuwe kultivars (suikerriet, sorghum en korog) wat die maksimum etanolopbrengs lewer. In 2010 is hierdie navorsingsgroep deur die Departement Handel en Nywerheid vereer as naaswenners (in die THRIP Competitiveness of Industry kategorie) gebaseer op hul samewerking met die Suid-Afrikaanse Suikerriet Navorsingsinstituut in die ontwikkeling van nuwe suikerrietkultivars vir bio-energieproduksie.

Groot betrokkenheid by internasionale simposium

Vyftig afgevaardigdes van elf lande het deelgeneem aan die International Federation of Automatic Control (IFAC) se simposium oor outomatisasie in die myn, minerale en metaalindustrieë wat in Augustus in Kaapstad plaasgevind het. Van die lande wat verteenwoordig was, is Chili, Duitsland, Japan, Kanada, Suid-Afrika, Suid-Korea, Swede en die Verenigde Koninkryk. Daar was 'n goeie verspreiding tussen die industrie en die akademie met 27 afgevaardigdes uit die nywerheid en 23 uit die akademie waarvan 11 studente was. Vier-en-dertig referate is gelewer. Prof Chris Aldrich, voorsitter van die Departement Prosesingenieurswese, was voorsitter van die nasionale reëlingskomitee, terwyl dr Gordon Jemwa redakteur van die geëvalueerde verrigtinge was. Prof Aldrich is ook verkies tot die nasionale reëlingskomitee van die IFAC-wêreldkonferensie wat in 2014 in Kaapstad gaan plaasvind.

Bedrywige jaar vir mineraalprosesseringsgroep

Aktiwiteite van die Mineraalprosesseringsgroep het in 2010 aansienlik toegeneem. Vyf permanente akademiese personeellede is by die groep betrokke. Hulle word deur 'n aantal voltydse navorsers ondersteun. Ruim befondsing van Lonmin Plc het toegelaat dat 'n spesialisingenieur in 2010 gewerf kon word om in die toekoms voltydse ingenieurs- en bestuursondersteuning aan die groep te

Dr Lidia Auret, die wenner van die 2010 Kanseliersmedalje, en haar promotor, prof Chris Aldrich.

Dr Lidia Auret, winner of the 2010 Chancellor's Medal, and her promoter, Prof Chris Aldrich.

Process Engineering produces top student

It was indeed a proud moment for the Department of Process Engineering when one of its students, Dr Lidia Auret, received the Chancellor's Medal at the December graduation ceremony, where she also received her PhD degree. She received the University's prestigious award as top student in 2010 due to her excellent study record. She maintained an average of 87,8% in her undergraduate studies and her master's degree was upgraded to a PhD. The title of her thesis was *Process monitoring and fault diagnosis using random forests* and her promoter was Prof Chris Aldrich. Dr Auret will pursue her postdoctoral studies with support in the form of a fellowship from the Claude Leon Foundation.

Women in engineering

Chemical Engineering is a popular field for women and 36% of this Department's students belong to the fairer sex. Process Engineering was therefore well-represented at the annual SAWomENG conference which aims to keep women in the engineering profession. At the conference Analene Beyers, Nadia Church and Megan van Ster discussed social and engineering problems with 67 other women students from all over the country. Young women on the threshold of their engineering careers and representatives from industry, the state and academia had ample opportunity to exchange knowledge and experience.

Bioprocessing group receives award

The Bioprocessing group, headed by Prof Johann Görgens, received an award from the Department of Trade and Industry. This group focuses on the production of bio-energy from renewable resources, and the production of industrial enzymes. Bio-energy is widely considered to be one of the major alternatives for sustainable, renewable energy supply. The group's research includes the production of bio-ethanol from lignocellulosic plant materials for use as fuel in transportation. Collaboration with plant breeders in this field has focused on the development of novel cultivars of sugarcane, sweet sorghum and triticale which give the maximum ethanol yield per hectare. In 2010 the research group was honoured at the dti Technology Awards as runner-up in the THRIP Competitiveness of Industry category based on their good collaboration with the South African Sugarcane Research Institute on the development of new sugarcane cultivars for bio-energy production.

Personnel involved in international symposium

Fifty delegates from eleven countries participated in the International Federation of Automatic Control (IFAC) symposium on automation in mining, mineral and metal industry held in Cape Town in August. Among the participating countries were Chile, Canada, Germany, Japan, South Africa, South Korea, Sweden and the United Kingdom. Industry with 27 delegates, and academia with 23, which included 11 students, were evenly represented. Thirty-four papers were delivered. Prof Chris Aldrich, Departmental Chair, chaired the national organising committee of the symposium, while Dr Gordon Jemwa served as editor of the refereed proceedings. Prof Aldrich is also a member of the national organising committee of the IFAC World Congress that will be held in Cape Town in 2014.

Active year for mineral processing group

The Mineral Processing group's activities increased considerably in 2010. Five permanent academic staff members are involved, supported by a number of full-time researchers. Generous funding by Lonmin Plc allowed recruitment of a specialist engineer in 2010 to provide full-time engineering and managerial support for the group. More than 20 postgraduate students, half of whom were at

Die stoomgeweer word deur die Bioprosesseringsgroep gebruik in die voorafbehandeling van lignosellulose.

The steam gun is used by die Bioprocessing group in the pretreatment of lignocellulose.

verleen. Meer as 20 nagraadse studente, waarvan die helfte PhD-studente is, het op mineraalprosesseringprojekte gewerk. As gevolg van die groei was die groep in staat om navorsings- en industrie-verwante projekte oor 'n breër spektrum te onderneem. Aktiwiteite het gewissel van fundamentele studie op PhD-vlak tot raadgewende projekte vir die nywerheid op die gebied van smeltoond-ontwerp.

Groeplede was aktief betrokke by navorsing en bywoning van plaaslike en oorsese konferensies. Hulle het deelgeneem aan die verrigtinge by die Infacon XII in Helsinki, Precious Metals 2010 in the Verenigde Koninkryk, Process Mineralogy 2010 in Kaapstad and the 4de Internasionale Platinumkonferensie by Sun City.

'n Besoek is gebring aan prof Pekka Taskinen se navorsingsgroep by die Departement Materiaalkunde en Ingenieurswese by Aalto Universiteit, Helsinki. Dit het deel uitgemaak van samewerking op die gebied van termodinamiese modellering van wateroplossings wat op hidrometallurgiese prosesse van toepassing is. Groeplede het ook gedien op die reëlingskomitee van die SAIMM se 2010 mineraalprosesseringskonferensie wat in Kaapstad gehou is met prof Steven Bradshaw wat die posisie as voorsitter van die Wes-Kaap-tak vir die periode 2010 tot 2011 sal beklee.

Die groep se sterk fokus op die Suid-Afrikaanse strategies belangrike platinumindustrie, wat van fundamentele pirometallurgiese studie tot hidrometallurgiese prosesontwikkeling strek, het gelei tot die ondertekening einde 2010 van 'n groot nuwe kontrak met Lonmin. Dit sal die toekomstige aktiwiteite op hierdie gebied 'n reuse hupstoot gee.

Departement gasheer by bierbroukompetisie

In die hartjie van die Wynland het die Departement opgetree as gasheer in die derde Intervarsity Bierbroukompetisie wat 21 Augustus by Stellenbosch Lodge gehou is. Na hul oorwinning verlede jaar, moes die Maties vanjaar die knie buig voor die span van Tukkies wat twee van die drie kategorieë gewen het om as algehele wenners gekroon te word. Die Matiespan het derde geëindig in die kategorie vir spesialisbier met hul Honey Pils. Drie van die vyf lede van die Matiespan, Nardus Uys, Eben Uys en Reinhardt Barnard, is studente van die Departement Prosesingenieurswese.

Personalia

Prof Chris Aldrich het 1 Januarie 2010 ingeskuif in die voorsitterstoel van die Departement nadat prof André Burger hierdie posisie vyf jaar lank beklee het.

'n Jong navorser, dr Cara Schwarz, het 'n Y1-gradering van die Nasionale Navorsingstigting ontvang vir haar werk as senior navorser in skeidingstegnologie.

Dr Cara Schwarz het 'n Y1-gradering van die Nasionale Navorsingstigting ontvang.

Dr Cara Schwarz received a Y1 rating from the National Research Foundation.

the PhD level, worked on mineral processing projects. The group was able to undertake a broader range of research and industrially-related projects as a result of this growth, and activities ranged from fundamental studies at PhD level to industrial consulting projects on furnace design.

Group members were active in research and conference visits locally and abroad, with attendance and participation at Infacon XII in Helsinki, Precious Metals 2010 in the UK, Process Mineralogy 2010 in Cape Town and the 4th International Platinum Conference at Sun City. Visits were made to Prof Pekka Taskinen's research group at the Department of Materials Science and Engineering, Aalto University, Helsinki, as part of collaborative work on the thermodynamic modelling of aqueous solutions applicable to hydrometallurgical processes. Group members were also on the organising committee of the SAIMM's Mineral Processing 2010 conference held in Cape Town, and Prof Steven Bradshaw will serve as Chair for the Western Cape Branch for the period 2010-2011.

The group's strong focus on South Africa's strategically important platinum industry, with projects ranging from fundamental pyrometallurgical studies to hydrometallurgical process development, led to the signing of a major new contract with Lonmin at the end of 2010, and a significantly expanded activity in this area is envisaged for the future.

Department hosts beer brewing competition

In the heart of the Winelands the Department hosted the third annual Intervarsity Brewing Competition held at Stellenbosch Lodge on 21 August. After their triumph at last year's competition, the Matie team had to concede victory to the Tuks team that won two out of three categories and were crowned overall winners. The Maties' Honey Pils put them third in the category for specialist beer. Three of the five members of the team, Nardus Uys, Eben Uys and Reinhardt Barnard, are from the Department of Process Engineering.

Personalia

On 1 January 2010 Prof Chris Aldrich took over as Departmental Chair from Prof André Burger who served in this position for five years.

A young researcher, Dr Cara Schwarz, received a Y1 rating from the National Research Foundation for her work as senior researcher in separation technology.

Die Matiespan wat aan die bierbrou Intervarsity deelgeneem het.

The Matie team that took part in the beer brewing Intervarsity.

Die Departement Prosesingenieurswese het 14 voltydse dosente, en navorsing by die Departement en die Sentrum vir Prosesingenieurswese sluit 'n aantal addisioneel aangestelde navorsers, nadoktorale genote en twee buitengewone professore in. Die hoofareas van navorsing sluit in:

Omgewing en Energie

Daar word baie sterk gefokus op navorsing wat verband hou met hernieubare energie, soos byvoorbeeld die produksie van biobrandstowwe en brandstowwe wat deur middel van pirolise uit lignosellulose en afvalmateriaal verkry is.

Huidige navorsing fokus daarop om doeltreffendheid te verbeter ten opsigte van bio-energie omskakelingsprosesse en by die ko-produksie van bio-energieoprodukte met spesialiteitsbiopolimere en chemikalieë in 'n bioraffinadery-opset wat gelyksoortig aan 'n petroleumraffinadery is.

Vanuit 'n suiwer omgewingsoogpunt word sterk navorsing gedoen op die bestuur en behandeling van nywerheidsafvloeisels en ontsouting van water. Ander navorsingsaktiwiteite met 'n omgewingsfokus is gekoppel aan bioprosesingenieurswese, en sluit in: (a) ontwikkeling van doeltreffende mikrobiese stelsels vir die vervaardiging van spesialiteitsensieme wat gebruik word in die prosessering van plantbiomassa in verskeie waardekettings soos bv. spesialteitsbiopolimere en chemikalieë, en (b) ondersoek van spesifieke prosesse om die werking van bio-organismes te optimeer om sodoende die vervaardiging van koste-doeltreffende entstowwe teen menslike papillomavirus- en rotavirusinfeksies te verbeter.

Mineraalprosessering

'n Wye reeks aktiwiteite word onderneem op die gebied van pirometallurgie, hidrometallurgie, fisiese prosessering sowel as konsentreerdermodellering, monitering en beheer. Fisiese proefneming word op al hierdie gebiede gedoen. Dit word aangevul deur numeriese modellering, met groot klem op berekeningsvloeidinamika, modellering van gebonde partikels, en hoëtemperatuur termochemie. Navorsing is nywerheidsgerig, en strek van fundamentele ondersoeke tot groot prosesontwikkelings.

Skeidingstegnologie

Die primêre doelwit van distillasienavorsing is om verbeterde massa-oordrag te verkry deur onreëlmatige pakking, gestruktureerde pakking en plate te gebruik. Navorsing in superkritiese ekstraksie fokus op binêre en multikomponent fase-ewewigte, en op nuwe toepassings en prosesse vir ekstraksie met superkritiese koolstofdioksied, etaan en propaan. Membraannavorsing ondersoek die skeiding van stowwe deur anorganiese en polimeriese membrane, sowel as die relevante vervaardigingstegnieke en minimering van bevuiling van membrane. Navorsing in koolstofdioksied-sekwestrasie fokus op die karakterisering van amienoplossings vir CO_2-sekwestrasie, asook die meting en modellering van die werkverrigting van gestruktureerde pakking in absorpsie. Ontwikkeling en verbetering van gepaste termodinamiese modelle en toestandsvergelykings dra by tot verbeterde modellering van verwante skeidings- en massa-oordragsprosesse.

Statistiese Modellering en Intelligente Prosesbeheer

Prosesmodellering, -beheer en -optimering speel 'n sleutelrol in die chemiese en metallurgiese industrieë. Die Departement spits hom veral toe op data-analitiese metodes, stelselidentifikasie, intelligente besluitnemingstelsels en die ontwikkeling van diagnostiese prosesstelsels vir monitering van mineraalverwerkingtoerusting en -prosesbane.

The Department of Process Engineering has 14 full-time teaching staff members, with research at the Department and its Centre for Process Engineering including additionally employed researchers, post-doctoral fellows and two extraordinary professors. The main areas of research include the following:

Environment and Energy

There is a strong research focus on renewable energy, for example the production of biofuels and pyrolysis-derived fuels from lignocellulose and waste material. The current research focus has been on improving the energy efficiency of bio-energy conversion processes, and co-production of bio-energy products with speciality biopolymers and chemicals in a biorefinery set up that is analogue to a petroleum refinery.

From a strictly environmental perspective, major research efforts involve the management and handling of industrial waste materials, as well as the desalination of water. Other research activities with an environmental focus are linked to bioprocess engineering, which include: (a) development of efficient microbial systems for production of speciality enzymes that are used for processing of plant biomass into various value chains such as speciality biopolymers and chemicals, and (b) investigation of specific processes to optimise the function of bio-organisms for improving the production of cost-effective vaccines against infections of the human papillomavirus and rotavirus.

Mineral Processing

A wide range of activities is undertaken in the fields of pyrometallurgy, hydrometallurgy, physical processing as well as concentrator modelling, monitoring and control. Physical experimentation is undertaken in all these areas. This is complemented by numerical modelling, with strong focuses on computational fluid dynamics, bonded particle modelling and high temperature thermo-chemistry. Research is industrially relevant, with studies ranging from fundamental investigations to major process developments.

Separation Technology

The primary aim of distillation research is to improve mass transfer using random packing, structured packing and trays. Supercritical extraction research focuses on binary as well as multi-component phase equilibria and new applications and processes for extraction using supercritical carbon dioxide, ethane and propane. Membrane research investigates the separation of substances across inorganic and polymeric membranes, as well as the relevant manufacturing techniques and minimisation of fouling of membranes. Research in carbon dioxide sequestration focuses on the characterisation of amine solutions for CO_2 sequestration, as well as the measurement and modelling of structured packing performance in absorption. Development and improvement of appropriate thermodynamic models and equations of state contribute to improved modelling of related separation and mass-transfer processes.

Statistical Modelling and Intelligent Process Control

Process modelling, control and optimisation play a key role in the chemical and metallurgical industries. The Department focuses particularly on data analytical methods, system identification, intelligent decision support systems and the development of diagnostic systems for monitoring of mineral processing equipment and process circuits.

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Departement
SIVIELE INGENIEURSWESE

Department of
CIVIL ENGINEERING

Konstruksie-ingenieurswese en -bestuur

Die Departement Siviele Ingenieurswese het in Januarie 2010 sy derde geborgde leerstoel gekry. Die Murray en Roberts Leerstoel in Konstruksie-ingenieurswese en -bestuur sal fokus op industrietransformasie, innovasie in konstruksie-ingenieurswese asook bestuurspraktyke vir die implementering van groot, multidissiplinêre kapitaalprojekte. Prof Jan Wium is die bekleër van die leerstoel. Alhoewel die leerstoel ook op finalejaarvlak aan die voorgraadse leerplan sal deelneem, is die fokus hoofsaaklik op nagraadse programme. Kursusse wat aangebied word, sluit in bestuur op die gebied van konstruksie, projekte, kontrakte, risiko, finansies, strategie, bedryf, en fasiliteite. Die goed-gevestigde konstruksiebestuursprogram (CMP), wat sedert 1976 aangebied word, val ook onder die vaandel van die leerstoel. Dié program, wat 'n internasionale reputasie vir uitnemendheid geniet, is sterk in pas met die industrie en die land. Dit is gerig op middelbestuur ingenieurs en praktisyns met potensiaal om tot korporatiewe bestuursvlak te vorder. Die borgskap bied ook nagraadse beurse in die veld.

Struktuuringenieurswese en ingenieursinformatika

'n Nuwe navorsingsgroep wat die jaar tot stand gekom het, fokus op die volhoubaarheid van die bouomgewing. Waar daar aanvanklik net gekyk is na bepaling en kwantifisering van volhoubaarheid as sulks, het daar 'n behoefte ontstaan om dit uit te brei na 'n praktiese veld. Na aanleiding van die groot behoefte aan behuising in Suid-Afrika, het hieruit voortgevloei om die navorsing toe te spits op laekoste behuising en dit sal later ook uitgebrei word na alternatiewe tegnologieë en materiale. Hersiklering van bourommel van gesloopte strukture sal ook onder die loep kom en standaarde sal daar gestel word vir die implementering en die hergebruik van sodanige materiaal in beton.

Dr Celeste Barnardo is aangestel op 'n internasionale komitee wat te make het met strukturele veiligheid en ontwerpstandaarde vir strukture. Dié komitee, die Joint Committee for Structural Safety (JCSS), vergader twee maal per jaar. 'n Navorsingsprojek wat die Departement in samewerking met die JCSS uitvoer, fokus op die gebruik van 'n lewensgehalte-indeks vir die bepaling van teikenbetroubaarheidswaardes vir strukturele ontwerp.

Waterboukunde en omgewingsingenieurswese

Suid-Afrika is waterarm, en daarom is die bewaring van waterhulpbronne van kardinale belang. 'n Waternavorsingskommissieprojek wat in 2010 afgeskop het, doen navorsing op die invloed van klimaatsverandering op watergehalte van damme. Wageed Kamish en sy studente ondersoek hoe sensitiewe damme in die Wes-Kaap (Voëlvlei en Bergrivier) bedreig word in terme van voedingstowwe en alge.

Die Instituut vir Waterboukunde en Omgewingsingenieurswese het moderne, kompakte apparaat aangekoop wat die gehalte van navorsing in riviere aansienlik sal verbeter. Die *River Surveyor* uit Amerika is toegerus met sonar en GPS wat dit in staat stel om akkurate opmetings van die profiel van 'n rivier te maak, en ook die vloeisnelheid en -volume van die water te meet. Die data wat hieruit verkry word, word dan nuttig aangewend in verdere hidrologiese berekeninge om bv. sedimentvervoer te bepaal. Die nuwe apparaat is in die Bergrivier uitgetoets en ook reeds ingespan vir navorsingsprojekte in die Zambezirivier in Mosambiek en in die Langebaanstrandmeer.

Geotegniese en vervoeringenieurswese

In 'n land waar die voertuiglading op paaie snel toeneem, is daar 'n groot behoefte aan wyses om die verkeersvloei, bestuurdergedrag en die hantering van noodsituasies en insidente te bestuur. Daar is dus groot ruimte vir 'n nuwe veld genaamd intelligente vervoerstelsels waar elektroniese kommunikasie en inligtingstelsels gebruik word om verkeersvloei deur middel van kameras, kennisgewingborde, ens. op snelweë te verbeter. In Kaapstad is daar 'n verkeersbeheersentrum waar alle aspekte wat met inligting oor paaie te make het vanuit een sentrum gesamentlik deur die drie padowerhede koördineer word, te wete SANRAL, die provinsiale regering en die metroraad. Prof Christo Bester en drie van sy M-studente is nou betrokke by navorsing op inligting wat ingesamel word van videokameras wat oral op die snelweë in Kaapstad voorkom. Hulle kyk eerstens na die ontwikkeling van 'n doeltreffende stelsel op die gebied van dataversameling, databestuur en verkeersbeheer om verkeersopeenhoping

Prof Jan Wium, bekleër van die Murray en Roberts Leerstoel in Konstruksie-ingenieurswese en -bestuur saam met sy nagraadse studente.

Prof Jan Wium, incumbent of the Murray and Roberts Chair in Construction Engineering and Management, with his postgraduate students.

Construction engineering and management

The third sponsored Chair in the Department of Civil Engineering was established in January 2010. The Murray and Roberts Chair in Construction Engineering and Management will focus on industry transformation, innovation in construction engineering and management practices for the implementation of major capital projects. Prof Jan Wium is the incumbent of the Chair. Although there is some participation in the final-year undergraduate curriculum, the focus will be mainly on postgraduate programmes. Courses offered include management in the fields of construction, projects, contracts, risk, finances, strategy, operations and facilities. The well-established Construction Management Programme (CMP), which has been presented since 1976, also falls under this Chair. This programme has an international reputation for excellence and is relevant to industry and the country. It is aimed at engineers and practitioners at middle management level who have the potential for advancement into corporate management. The sponsorship of the Chair also includes postgraduate bursaries.

Structural engineering and engineering informatics

A new research group established this year focuses on sustainability in the building environment. Initially research covered only the assessment and quantification of sustainability *per se*, but subsequently, the need to take it to a practical level was identified. In the light of the dire need for housing in South Africa, it was decided to steer this research in the direction of low-cost housing. At a later stage, this will be extended even further to include alternative technologies and materials. The recycling of building rubble from demolished structures will also be scrutinised and standards will be determined with regard to the implementation and re-use of such materials in concrete.

Dr Celeste Barnardo was elected to serve on an international committee that deals with structural safety and design standards for structures, the Joint Committee for Structural Safety (JCSS), which meets biannually. A research project in collaboration with the JCSS focuses on the use of a life quality index for the determination of target reliability levels for structural design.

Water and environmental engineering

South Africa is a water scarce country and water conservation is therefore of cardinal importance. A Water Research Commission project which kicked off in 2010 carries out research on the influence of climate change on the water quality of dams. Work done by Wageed Kamish and his students examines the threat nutrient enrichment and nuisance algae bloom pose to sensitive dams in the Western Cape (Voëlvlei and Berg River).

The Institute for Water and Environmental Engineering acquired modern, compact apparatus that will improve the quality of research in rivers considerably. The *River Surveyor*, an American product, is equipped with sonar and GPS which enables it to do accurate surveys of the river profile as well as the flow speed and flow volume of the water. Data obtained will be used in hydrological calculations for sediment flow, etc. The new apparatus was tested out in the Berg River and has also been used in research conducted in the Zambezi River in Mozambique and in the Langebaan Lagoon.

Geotechnical and transportation engineering

In a country where there is a sharp increase in the number of vehicles on the road, there is a great need to manage traffic flow, driver behaviour and the handling of emergency situations and incidents. This paves the way for a new field, namely intelligent transport systems, where electronic communication and information systems are used to improve traffic flow by means of cameras, information boards, etc. on highways. In Cape Town there is a traffic control centre where all aspects of information regarding roads are coordinated jointly by the three authorities, namely SANRAL, the provincial government and the metro council. Prof Christo Bester and three of his master's students are involved in research on information recorded by the video cameras on highways in Cape Town. This involves the development of an effective system for data collection, data management and control of traffic flow in order to improve traffic congestion on highways. Another

Prof Milan Holický wat aangestel is as buitengewone professor en dr Celeste Barnardo wat op die internasionale Joint Committee for Structural Safety verkies is.

Prof Milan Holický who was appointed as Extraordinary Professor and Dr Celeste Barnardo who was elected to serve on the international Joint Committee for Structural Safety.

op snelweë die hoof te bied. Nog 'n aspek van hul navorsing is metodes om die versameling van inligting oor ongelukke/insidente te verbeter. 'n PhD-student van prof Bester doen ook interessante navorsing op die aantreklikheid van die toepassing van intelligente vervoerstelsels op die minibustaxibedryf. Hierdie toepassings sluit in elektroniese voertuigmonitering en vlootbestuur deur middel van GPS en GPRS, datakommunikasie tussen voertuie en die beheersentrum, intydse passasierinligting, elektroniese betaalstelsels, ens.

Die afgelope jaar het die Sentrum vir Padveiligheidstudie onder leiding van dr Marion Sinclair hoofsaaklik gefokus op die rol van menslike faktore as 'n komponent van veilige paaie. In samewerking met die Lund Universiteit in Swede is daar besonder aandag gegee aan die rol van kultuur in padgebruikersgedrag. Die Departement is deur die Wes-Kaapse provinsiale regering se Departement Vervoer en Openbare Werke getaak om 'n model te ontwikkel om die gemeenskap by provinsiale padveiligheidskwessies te betrek. Navorsing word ook gedoen op voetgangergedrag in Stellenbosch, die interaksie tussen padgebruikers by kruisings, en die omvang van sitplekgordelgebruik in die Kaapse Metro. Dr Sinclair het haar werk voortgesit om belangstelling in interdissiplinêre padveiligheidsake in die wyer Universiteitsgemeenskap aan te moedig en het hiermee die Fakulteit Gesondheidswetenskappe gehelp om 'n nuwe navorsingsfokus te identifiseer wat die werk van die Departement Siviele Ingenieurswese sal aanvul.

Leon Croukamp en van sy studente is betrokke by geotegniese werk op 'n ruimte geodesie-projek wat die afstand tussen die Aarde en die Maan akkuraat met 'n groot laser gaan meet. Matjiesfontein met sy uitstekende atmosferiese toestande is gekies as die ideale plek vir die oprigting van dié laser wat die eerste van sy soort in die Suidelike Halfrond is, en ook slegs een van vyf in die wêreld. Die sewe-ton-laser is deur die Franse Regering geskenk. Verskeie plaaslike instansies is by die projek betrokke o.a. die Tshwane Institute for Advanced Studies, die Nasionale Navorsingstigting, die Departement Wetenskap en Tegnologie en Universiteit Stellenbosch, asook verskeie internasionale vennote. Inligting wat verkry word, sal aan die internasionale ruimtegemeenskap beskikbaar gestel word.

Studente

Die oplewing in die belangstelling in siviele ingenieurswese wat die afgelope paar jaar te bespeur was, het in 2010 voortgeduur met ongeveer 200 eerstejaars wat vir die rigting registreer het. Studente wat deel was van die eerste groot inname in 2006, het nou nagraadse vlak bereik en gevolglik is nagraadse getalle ook hoog, met 176 studente wat hulle vir nagraadse studie in siviele ingenieurswese ingeskryf het.

Die Departement het 'n kampioen kanovaarder in sy midde. Robyn Kime, 'n derdejaarstudent, het die Bergrivier-kanomarathon se afdeling vir vroue die tweede agtereenvolgende jaar gewen. Sy het al 'n streep oorwinnings agter haar naam. Vroeër die jaar het sy die uitmergelende Dusi-kanomaraton gewen en een van haar grootste seges was verlede jaar se Visrivier-kanomarathon vir enkelkano's. Haar eerste plek in daardie spesifieke wedvaart het haar die kroon as die Suid-Afrikaanse vroue-kampioen in dié sportsoort besorg. Me Kime was boonop in 2009 die beste tweedejaarstudent in haar klas.

Personalia

Leon Croukamp is vanaf 1 Maart aangestel as senior lektor in die Afdeling Geotegniese en Vervoeringenieurswese. Hy het 23 jaar ervaring as ingenieursgeoloog by die Raad vir Geowetenskap en was ook nou betrokke by veral dorpsontwikkeling en suurwater in myne op die Witwatersrand. Etienne van der Klashorst, 'n voormalige student van die Departement, het 1 April by die Afdeling Struktuuringenieurswese en Ingenieursinformatika as lektor aangesluit. Hy doseer in struktuuringenieurswese en sy spesialisgebied is staalstrukture. Vroeër was hy werksaam by Jeffares & Green Raadgewende Ingenieurs.

Twee nuwe laboratoriumbestuurders is aangestel: Matthys Saayman as hoof van die Waterlaboratorium en Matteo Dal Ben as hoof van die Geotegniese en Vervoerlaboratorium.

Prof Milan Holický van Tsjeggië is as buitengewone professor aangestel op grond van die waardevolle bydrae wat hy oor tien jaar gelewer het. Dit sluit in samewerking met die Departement asook blokkursusse in struktuurbetroubaarheid wat hy as besoekende professor aangebied het. Prof Holický is ook 'n lid van die JCSS.

Die kampioenroeier, Robyn Kime.

The champion canoeist, Robyn Kime.

aspect of their research is the development of improved methods of data collection on traffic accidents/incidents. A PhD student of Prof Bester's is doing interesting research to investigate the attractiveness of applications of intelligent transport systems in the minibus taxi industry. These applications include electronic vehicle monitoring and fleet management through the use of GPS and GPRS communications, data communication between vehicles and a control centre, real-time passenger information, electronic payment solutions and more.

Over the past year the Centre for Road Safety Studies, headed by Dr Marion Sinclair, has largely been engaged with investigating the role of human factors as a component of safe roads. In particular, attention has been given to the role of culture in road user behaviour. This investigation has been carried out in collaboration with the University of Lund, Sweden. The Department was tasked by the provincial government of the Western Cape to develop a model of community engagement around road safety issues for the Province. Research has also been carried out on pedestrian behaviour in Stellenbosch, the interaction of road users at junctions and the extent of seatbelt use in the Cape Metro area. Dr Sinclair has continued to reach across the wider University body to generate interest in interdisciplinary road safety research and has assisted the Faculty of Health Sciences to help in identifying a new research focus area that will complement the work carried out in the Department of Civil Engineering.

Leon Croukamp and some of his students are involved in geotechnical aspects of a space geodesy project which will measure distances between the Moon and the Earth accurately, using a large laser. Matjiesfontein was selected as a prime spot for the location of such a laser due to the excellent atmospheric conditions. The 7-ton laser was donated by the French Government and will be the first of its kind in the Southern Hemisphere and one of five in the world. Several local role-players include the Tshwane Institute for Advanced Studies, the National Research Foundation, the Department of Science and Technology and Stellenbosch University, with a host of international partners also participating. Data obtained will be made available to the international space community.

Students

The boom in the interest in civil engineering seen over the past few years continued in 2010 with 200 first-year students registering for this programme. Students who were part of the first large intake in 2006 have now reached postgraduate level and consequently postgraduate numbers (176) in Civil Engineering were also high.

The Department is extremely proud to have a champion canoeist in its midst. Robyn Kime, a third-year student, won the women's division in the Berg River Canoe Marathon for the second consecutive year. She has several victories to her name. Earlier in the year she won the challenging Dusi Canoe Marathon. One of her greatest triumphs was last year's Fish River Canoe Marathon where her victory handed her the crown of South African Women's Champion in this sport. Moreover, in 2009 she was the top student in her class.

Personalia

Leon Croukamp was appointed senior lecturer in the Division of Geotechnical and Transport Engineering from 1 March. He has 23 years' experience as an engineering geologist whilst working for the Council of Geoscience. He has vast experience in town development and acid mine water in the Witwatersrand. Etienne van der Klashorst, a former student in this Department, joined the Division of Structural Engineering and Engineering Informatics on 1 April. He lectures in structural engineering and his field of expertise is steel structures. Previously he was employed by Jeffaris & Green Consulting Engineers.

Two new laboratory managers were appointed: Matthys Saayman as head of the Hydraulic Laboratory and Matteo Dal Ben as head of the Geotechnical and Transport Laboratory.

Prof Milan Holický of the Czech Republic was appointed as Extraordinary Professor by virtue of the valuable contribution he has made to the Department over many years. This includes collaboration with the Department as well as block courses in structural reliability which he presented as Visiting Professor. Prof Holický is also a member of the JCSS.

Matthys Saayman met die nuwe apparaat, die River Surveyor.

Matthys Saayman with the new apparatus, the River Surveyor.

Struktuuringenieurswese

Dit sluit staalstrukture, betonmateriale en betonstrukture, struktuurbetroubaarheid, die toepassing van siviele ingenieursinformatika in die algemeen en staalstrukture in die besonder, asook volhoubaarheid van die beboude omgewing in. Navorsingsprogramme in en oor hierdie velde heen is gemoeid met ontwerplaste vir strukture, insluitend kodekalibrasie, oorhoofse beweegbare hyskraan ondersteuningstrukture en die diensbaarheidsgedrag van industriële strukture. Navorsing op beton behels die ontwikkeling van moderne sementbasis konstruksiemateriale, verbeterde betonstruktuurontwerpkonsepte, sowel as karakterisering van beton struktuurinteraksie met belastings soos grondverskuiwings, wind, seismisiteit asook waterhoudende strukture. Die navorsing op betonstrukture en belastings behels uiteindelike implementering in die beton struktuurontwerpkode en belastingskode. Volhoubaarheid, en die modellering en optimering van die impak van konstruksie en die beboude omgewing op die omgewing, is 'n jong navorsingsveld in die Departement.

Siviele Ingenieursinformatika

Hierdie studieveld fokus op die behoeftes van die siviele ingenieurspraktyk in 'n informasiegedrewe omgewing. Die toepassing van Siviele Ingenieursinformatika is gemoeid met rekenaargesteunde projekte in 'n samewerkende omgewing, intelligente modellering van die ontwerpproses in struktuuringenieurswese, ondersteuningstelsels vir ingenieursbestuur en die tegniese aspekte van stedelike ingenieurswese.

Waterboukunde en Omgewingsingenieurswese

Die Afdeling dek spesialisasievelde soos waterbronontwikkeling, vloedhidrologie, rivieromgewingswaterbehoeftes, rivierhidroulika, hidrouliese strukture, damtoeslikking, kusboukundige ingenieurswese, hidrodinamiese modellering van dam en rivier watergehalte, water en afvalwater behandeling en waterdienste. Die velde waarop navorsing tans onderneem word, is opvanggebied sedimentleweringbepaling, damtoeslikking, intydse waterhulpbronbestuur met hidrodinamiese modelle, seewaterontsouting, wateraanvraagbepaling en -bestuur, infrastruktuurrehabilitasie, kus-erosie en hawe-ontwerp, en die invloed van klimaatsverandering op hidrologie en waterhulpbronne. Binne die subafdeling waterdienste is die fokus op waterverbruik, waterbesparing en ook die ontwerp en modellering van rioolstelsels.

Geotegniek en Vervoeringenieurswese

In vervoeringenieurswese word navorsing gedoen op padveiligheid en die oorsaak van ongelukke, die beplanning van openbare vervoerroetes, minibus taxi bewegings en Intelligente Vervoersisteme. Studentgeörienteerde navorsing in plaveiselingenieurswese dek versnelde toetse van asfalt insluitende MMLS-toetse en vierpuntsbuigvermoeïingstoetse, navorsing op omgewingsvriendelike bitumen gestabiliseerde materiale deur die gebruik van drie-assige- en vermoeïingstoetse, ontwikkeling van 'n seëlontwerpmetode vir bitumen en gemodifiseerde bindmiddels gebaseer op die gedrag daarvan, en 'n mengselontwerp- en ontledingstelsel vir asfalt kroonlae.

Konstruksie-ingenieurswese en -bestuur

Hierdie Afdeling fokus op die bestuur en ontwikkeling van multidissiplinêre kapitaalprojekte. Projekte sluit in 'n ondersoek na die vaardighede wat ingenieurs benodig om multidissiplinêre projekte te inisieer en te bestuur, asook die maniere waarop hierdie vaardighede oorgedra en ontwikkel kan word. Die Afdeling ondersoek die gebruik van voorafvervaardigde elemente en modulêre konstruksie, asook die manier waarop dit saam met *in situ* beton gebruik word om aflewering te versnel.

Structural Engineering

This includes steel structures, concrete materials, structural reliability, the application of civil engineering informatics in general and steel structures in particular, as well as sustainability of the built environment. Research programmes within and across these fields are concerned with design loads for structures, including code calibration, overhead travelling crane support structure performance and serviceability performance of industrial structures. Research on concrete involves the development of modern cement-based materials, improved concrete structural design concepts, as well as characterisation of structural interaction with loads such as soil settlements, wind and seismicity, as well as liquid retaining structures. The research on concrete structures incorporates eventual implementation in the concrete structural design code and loading code. Sustainability of the built environment is a recent research field in the Department, with goals to objectively model and subsequently minimise the environmental impact.

Civil Engineering Informatics

This field of research focuses on the needs of the civil engineering practice in an information-driven environment. Application of Information Technology in civil engineering is concerned with collaborative engineering, intelligent modelling of the design process in structural engineering, support systems for engineering management and technical aspects of urban engineering.

Water and Environmental Engineering

These fields of specialisation include water resources development, flood hydrology, environmental water requirements, river hydraulics, reservoir sedimentation, oceanological engineering, hydrodynamic reservoir/river water quality modelling, water and wastewater treatment and water services. Research is currently carried out on the morphology of rivers as impacted on by dams, scour at bridges and other hydraulic structures, the discharge capacity of water transfer tunnels, the measurement of discharge in rivers, the design of fish ladders at obstructions in rivers, the determination of environmental changes in rivers, the layout of pump stations in rivers, and sediment dynamics in estuaries. Within the subdivision water services the focus is on water use, saving of water and also the modelling of sewerage systems.

Transportation and Geotechnics

In transportation engineering research is done on road safety and the cause of accidents, the planning of public transport routes, minibus taxi movements and Intelligent Transport Systems. Student-orientated research in pavement engineering includes accelerated testing of asphalt including MMLS testing and beam fatigue tests, environment-friendly bitumen stabilised materials researched using triaxial and fatigue tests, development of a performance-related seal design method for bitumen and modified binders, and a mix design and analysis system of asphalt bases.

Construction Engineering and Management

This Division focuses on the management and development of multidisciplinary capital projects. It includes an investigation into the skills needed to initiate and manage such projects as well as ways in which these skills can be transferred and developed. The Division investigates the use of prefabricated elements and modular construction as well as the way in which it can be used together with *in situ* concrete to accelerate delivery.

Struktuuringenieurswese en Siviele Ingenieursinformatika
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Die Fakulteit Ingenieurswese het verskeie uitreikprogramme om belangstelling in wetenskap, ingenieurswese en tegnologie te prikkel:

Die jaarlikse Opedag wat veral daarop gemik is om leerders en ouers bewus te maak van die groot verskeidenheid loopbaanmoontlikhede wat die verskillende ingenieursdissiplines bied.
Navrae: August Engelbrecht
Tel: 021 808 4205, e-pos: august@sun.ac.za

Die jaarlikse Winterweek vir Graad 11 en 12-leerders wat ingenieurstudie oorweeg, waartydens hulle 'n idee kan vorm van die wêreld van die ingenieur deur middel van praatjies deur dosente en praktiserende ingenieurs, en besoeke aan nywerhede en laboratoria.
Navrae: Sandra Tribelhorn
Tel: 021 808 4203, e-pos: sandrab@sun.ac.za

Die jaarlikse Vroue in Ingenieurswesemiddag waar Graad 11 en 12-dogters, wat Wiskunde en Fisiese Wetenskappe neem, meer uitvind oor ingenieurswese as beroep vir die vrou. Hulle word toegespreek deur nagraadse damestudente en vroue ingenieurs uit die bedryf.
Navrae: August Engelbrecht
Tel: 021 808 4205, e-pos: august@sun.ac.za

Die jaarlikse Onderwysersaand waar Wiskunde, Fisiese Wetenskappe, en Voorligtingonderwysers ingelig word oor die ingenieursberoep, die dringende behoefte aan ingenieurs in die land, en die Fakulteit se graadprogramme.
Navrae: August Engelbrecht
Tel: 021 808 4205, e-pos: august@sun.ac.za

Tydens sessies reg oor die land word Topleerders (Graad 11 en 12) en hul ouers ingelig oor die loopbaanmoontlikhede wat ingenieurswese bied en die Fakulteit se graadprogramme.
Navrae: August Engelbrecht
Tel: 021 808 4205, e-pos: august@sun.ac.za

Om diversiteit in die Fakulteit te verhoog, word 'n geleentheid gehou waar presteerders in Graad 12 uit die aangewese groepe en hul ouers kennismaak met bruin, swart en Indiër Rolmodelle in ingenieurswese wat reeds hul merk op hul gebied gemaak het, om die jong klomp sodoende aan te spoor om ingenieurswese te studeer.
Navrae: August Engelbrecht
Tel: 021 808 4205, e-pos: august@sun.ac.za

Die Broeikasprojek waar Graad 6-leerders, wat op vroeë ouderdom 'n aanleg vir Wiskunde en Wetenskap toon, tot hul Matriekjaar die Fakulteit jaarliks besoek om hul belangstelling in ingenieurswese as loopbaan te prikkel.
Navrae: August Engelbrecht
Tel: 021 808 4205, e-pos: august@sun.ac.za

Samelewing in Perspektief waar ingenieurstudente tutoriale in Wiskunde aanbied aan leerders van plaaslike hoërskole om leerders se belangstelling in ingenieurswese te prikkel, en om hulle te help om beter slaagpunte te verkry vir hierdie vak wat noodsaaklik vir ingenieurstudie is.
Navrae: Avril Ford
Tel: 021 808 3614, e-pos: aford@sun.ac.za

Die TRAC-program waar gerekenariseerde stelsels in die TRAC-laboratorium leerders help om wetenskapsbeginsels, soos Newton se Wette, baas te raak.
Navrae: Debbey Olivier
Tel: 021 808 4384, e-pos: debbey@sun.ac.za

Ingenieurswese neem ook deel aan die Maties Wiskunde en Wetenskapweek, waar werksessies vir Graad 10 tot 12-leerders in wiskunde, wetenskap en tegnologie aangebied word onder leiding van die Universiteit se Sentrum vir Voornemende Studente.
Navrae: Lorna Bartlett
Tel: 021 808 2370, e-pos: lbar@sun.ac.za

Die F1-in-Skole waar leerders in spanne saamwerk om 'n koolsuurgas-aangedrewe, miniatuur balsahout-motortjie deur middel van 'n rekenaar te ontwerp en te bou, en dan resies teen ander spanne in georganiseerde kompetisies te jaag.
Navrae: Anél de Beer
Tel: 021 808 3927, e-pos: au1@sun.ac.za

Die Tegnologie Olimpiade van SAIMegI wat leerders jaarliks uitdaag om 'n probleem aan te pak of 'n masjien te ontwerp en te bou. Die Departement Meganiese en Megatroniese Ingenieurswese staan skole en leerders by met raad en werksessies ten einde goeie projekte te lewer.
Navrae: Liesl van der Hoven
Tel: 021 808 4374, e-pos: lieslc@sun.ac.za

Minquiz, 'n wetenskap en tegnologievasvra vir Graad 12-leerders om loopbane in wetenskap en tegnologie, veral in mynbou, mineraalprosessering en geologie, te bevorder. Dit word deur Mintek gereël. Die Departement Prosesingenieurswese lewer ondersteuning in die Boland en die Wes-Kaap.
Navrae: Elton Thyse
Tel: 021 808 4491, e-pos: ethyse@sun.ac.za

The Faculty of Engineering has several outreach programmes to stimulate interest in science, engineering and technology:

The annual Open Day, which is aimed at creating awareness amongst learners and parents regarding the vast career opportunities offered by the different engineering disciplines.
Enquiries: August Engelbrecht
Tel: 021 808 4205, e-mail: august@sun.ac.za

The annual Winter Week for Grade 11 and 12 learners who are prospective engineering students, during which they can get a clear picture of the world of the engineer. This is achieved by talks by lecturers and practising engineers, and visits to industries and laboratories.
Enquiries: Sandra Tribelhorn
Tel: 021 808 4203, e-mail: sandrab@sun.ac.za

The annual Women in Engineering afternoon where Grade 11 and 12 girls who do Mathematics and Physical Sciences find out more about engineering as a career for women. They are addressed by postgraduate female students as well as women engineers from industry.
Enquiries: August Engelbrecht
Tel: 021 808 4205, e-mail: august@sun.ac.za

The annual evening for Teachers during which Mathematics, Physical Sciences and Guidance teachers are informed about the engineering profession, the dire need for engineers in the country, and the Faculty's degree programmes.
Enquiries: August Engelbrecht
Tel: 021 808 4205, e-mail: august@sun.ac.za

During sessions countrywide Top Learners (Grade 11 and 12) and their parents are informed about engineering as a career and the Faculty's degree programmes.
Enquiries: August Engelbrecht
Tel: 021 808 4205, e-mail: august@sun.ac.za

To improve the diversity in the Faculty, Grade 12 achievers from the designated groups and their parents are introduced to coloured, black and Indian engineering Role Models who have made their mark in their field, to encourage the youngsters to study engineering.
Enquiries: August Engelbrecht
Tel: 021 808 4205, e-mail: august@sun.ac.za

The Incubator project where Grade 6 learners, who show an aptitude for Mathematics and Science at an early age, visit the Faculty annually up to their Matric year in order to stimualte their interest in engineering as a career.
Enquiries: August Engelbrecht
Tel: 021 808 4205, e-mail: august@sun.ac.za

Society in Perspective where engineering students present tutorials in Mathematics to learners at local high schools in order to stimulate an interest in engineering and to help learners to obtain better pass marks in this subject that is essential for engineering studies.
Enquiries: Avril Ford
Tel: 021 808 3614, e-mail: aford@sun.ac.za

The TRAC programme that enables learners to master science principles such as Newton's Laws, by means of computerised systems in the TRAC laboratory.
Enquiries: Debbey Olivier
Tel: 021 808 4384, e-mail: debbey@sun.ac.za

Engineering also participates in the Maties Maths and Science Week organised by the Centre for Prospective Students. During this week, mathematics, science and technology workshops are presented to Grade 10 to 12 learners.
Enquiries: Lorna Bartlett
Tel: 021 808 2370, e-mail: lbar@sun.ac.za

The F1 in Schools where learners work in teams to design and build miniature balsa wood racing cars, powered by carbon dioxide. These cars are then raced in organised competitions.
Enquiries: Anél de Beer
Tel: 021 808 3927, e-mail: au1@sun.ac.za

The Technology Olympiad of SAIMechE, which challenges learners annually to tackle a problem or design and build a machine. The Department of Mechanical and Mechatronic Engineering provides assistance and advice to schools and learners by means of workshops to enable them to produce quality projects.
Enquiries: Liesl van der Hoven
Tel: 021 808 4374, e-mail: lieslc@sun.ac.za

Minquiz, a science and technology quiz for Grade 12 learners with the aim of promoting careers in science and technology, especially in mining, mineral processing and geology. It is organised by Mintek. The Department of Process Engineering provides assistance in the Boland and the Western Cape.
Enquiries: Elton Thyse
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Redakteur/Editor: Liesel Koch
Ontwerp en Uitleg/Design and Layout: Soretha Botha, Grafixit