Postgraduate opportunities at the Faculty of Engineering, Built Environment and Information Technology

UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

Faculty of Engineering, Built Environment and Information Technology

Fakulteit Ingenieurswese, Bou-omgewing en Inligtingtegnologie / Lefapha la Boetšenere, Tikologo ya Kago le Theknolotši ya Tshedimošo

Innovating our tomorrow

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The EBIT Generation makes a real difference

The Faculty of Engineering, Built Environment and Information Technology (EBIT) at the University of Pretoria (UP) is home to a generation of leaders and innovators who are dedicated to improving their lives, the lives of their families, their country and the world. The Faculty attracts high-quality students and staff who actively contribute to engineering, the built environment, information technology, as well as engineering and technology management.

Qualified professionals in these fields are assets to the economy of a country. They possess highly technical skills and process-thinking abilities, and they are problem-solvers. As such, professionals in these fields have the ability to make an important contribution not only to their respective industries, but also to wide-spread social welfare. With its wide range of specialist fields, EBIT develops a unique collection of critical skills through collaboration and a commitment to research excellence.

Why study towards a postgraduate degree?

In South Africa, many professional occupations require graduates to undertake further study in order to register with professional bodies. Such professional registration typically allows postgraduate professionals to occupy highly satisfying positions in established companies or organisations, or to undertake rewarding consultation work. Honours and master's degree programmes in the Faculty allow postgraduate students to obtain specialised knowledge in their chosen fields, which will benefit them in their careers in industry. Postgraduate degree programmes also enable students to undertake focused research on a topic that is relevant to both their working environment and to further scholarship.

Why study towards a PhD?

For students who find their passion in research and for those who wish to pursue an academic career, a PhD from EBIT is an invaluable asset. As a research student in the Faculty, you will have the opportunity to make a very real impact on our world by advancing knowledge and creating technology and science development opportunities for the next generation of researchers.

Research is an essential component in the promotion of creativity and knowledge exchange, and the Faculty is dedicated to the pursuit of excellence in this regard. EBIT is home to some of the University's most accomplished researchers, and supports new researchers to join this cohort.

Attaining a PhD is not just about being granted a title. It is a chance to achieve something significant through one's own perseverance and to learn something new while extending the frontiers of knowledge. A PhD is a globally recognised academic degree that is both valuable and highly credible, and that gives one the confidence to further one's academic career. The efforts required and the achievement attained are recognised both within the University and in industry.

EBIT alumni relationships

EBIT believes in continuing the relationship that has been formed with its students even after they graduate. Many of the Faculty's alumni occupy leading positions in industry and have made important contributions to the economic development of South Africa and countries around the world. Alumni support the Faculty by raising sponsorships and ensuring that high skills and educational standards are maintained. They make their services available as external examiners, and are available for industry discussions and to offer guidance. They are also willing to mentor and support students by means of bursaries and internship opportunities so that newly qualified graduates can make a difference when they enter industry.

Choose UP

Vision: *To be a leading research-intensive university in Africa, recognised internationally for its quality, relevance and impact, and for developing people, creating knowledge and making a difference locally and globally.*

The University of Pretoria was established in 1908. It is located in South Africa's vibrant administrative capital city, Pretoria. As one of the country's oldest and most prestigious universities, UP produces sought-after graduates, who become well-rounded citizens. The University strives to instill in its students, graduates and staff a realisation that every action in the present shapes the future, and encourages them to make today matter.

The University is home to nine faculties and a business school, and academic and student activities take place across seven campuses in Hatfield, Hillcrest, Groenkloof, Prinshof, Onderstepoort, Mamelodi and Sandton. Its facilities boast state-of-the-art laboratories and equipment for use in teaching, learning and research.

However, UP's most important asset is its creative capital – an arsenal of thinkers and innovators whose ideas can be used to advance cutting-edge research, make a social impact and be turned into valuable products and services. Over the years, UP has consistently achieved research outcomes that place it among the top-performing research institutions in South Africa. The University intentionally focuses on research that matters in areas that demonstrate an impact on society. To this end, UP files around 10 South African and 15 international provisional patent applications per year.

"If you are an independent thinker who is eager to discover and create new knowledge that will make a difference in your community and in the world, then UP is a place where you can excel."

– Prof Cheryl de la Rey, Vice-Chancellor and Principal of UP

49%

OF UP STUDENTS ARE ENROLLED IN PROGRAMMES DEDICATED TO SCARCE SKILLS AREAS

28%

OF ALL PROFESSIONAL ENGINEERING GRADUATES AT SA UNIVERSITIES GRADUATE FROM UP

64%

OF ACADEMIC STAFF MEMBERS AT UP HAVE DOCTORAL QUALIFICATIONS

International partnerships and collaboration

Partnerships and collaboration on the African continent are a particularly important part of UP's 2025 strategy, and several institutes, centres and units at UP support research that reaches into the continent. To support this strategy, UP maintains a strong international profile among its students, staff and academic output.

825

INTERNATIONAL DOCTORAL STUDENTS AT UP IN 2017

235

INTERNATIONAL POSTDOCTORAL FELLOWS AT UP IN 2018

1 018

INTERNATIONAL CO-AUTHORSHIPS AT UP IN 2017

EBIT IS ONE OF A KIND

The Faculty of Engineering, Built Environment and Information Technology at UP is the only faculty at a higher education institution in South Africa that offers the unique combination of these three fields. This places it in a position to conduct exceptional multi-disciplinary research to address relevant challenges in society. EBIT also actively contributes to the development of industry. Seven out of the top ten occupations in high demand in South Africa are based on study programmes presented by the Faculty.

Message from the Dean

Thuma Mina – we are ready

As South Africa prepares for the 4th Industrial Revolution (4IR), EBIT focuses its research efforts on bringing competitive knowledge to industry, education and society. The call to work together to build a new knowledge economy and better South Africa has been actioned through a range of initiatives. These include its new Future Transportation and Sustainable Future Smart Cities infrastructure and research programme, its world-leading Big Data and Data Science Institute, as well as externally funded research chairs focusing on a strategic niche areas related to the 4IR.

Every day, global technology is evolving on an exponential scale. In answer to this, EBIT is eager to embrace the challenges of the 4IR, armed with exceptional researchers, and cutting-edge teaching, learning and laboratory facilities. Opportunities for industry-relevant collaborative research are constantly investigated to ensure that the Faculty is ready to embrace and overcome future challenges and industry partnerships that can enable the development of scarce and specialised skills. Through these partnerships, the Faculty is well equipped to support its many leading research chairs and entities. These partnerships also enable the Faculty to develop and maintain its extensive and cutting-edge facilities across the University's Hatfield and Hillcrest campuses.

As you prepare to embark on your postgraduate journey, I wish you perseverance and optimism. Your prize will be the satisfaction of accomplishment and prosperous career opportunities. As a step towards your future, I would like to invite you to apply for postgraduate study at UP and to join a world-class research institution.

Prof Sunil Maharaj

Become a part of the EBIT Generation

EBIT is a source of locally relevant and internationally competitive programmes, and home to some of the University's exceptional researchers. The Faculty is organised into four schools, each with a range of industry-relevant degrees. These schools are the School of Engineering, the School for the Built Environment, the School of Information Technology and the Graduate School of Technology Management. EBIT contributes to the delivery of professionals and the creation of knowledge in a wide range of industries through its diverse academic fields, organised through 14 specialised academic departments.

TOP 0.5%

OF ENGINEERING SCHOOLS IN THE WORLD IN 2018 ISI ESSENTIAL SCIENCE INDICATORS

TOP 375

RANKED GLOBALLY FOR ENGINEERING AND TECHNOLOGY IN 2018 QS RANKINGS

TOP 200

2018 QS RANKINGS FOR ARCHITECTURE AND THE BUILT ENVIRONMENT IN THE WORLD

EBIT is ranked in five subject categories in the QS World University Rankings by Subject:

ARCHITECTURE AND THE BUILT ENVIRONMENT

CHEMICAL ENGINEERING

COMPUTER SCIENCE AND INFORMATION SYSTEMS

ELECTRICAL AND ELECTRONIC ENGINEERING

MECHANICAL, AERONAUTICAL AND MANUFACTURING ENGINEERING

33 CUTTING-EDGE RESEARCH CHAIRS AND ENTITIES

EBIT researchers are ranked by the South African National Research Foundation (NRF)

76 NRF-RATED RESEARCHERS

3 NRF A-RATED RESEARCHERS

Message from the Deputy Dean: Research and Postgraduate Education

Supporting cross-cutting research

Through the Faculty's research strategy, we encourage research and innovation that is not restricted to finding solutions to challenges within a particular discipline only, but rather to developing initiatives that will have an impact locally, regionally and across the globe. Each research focus area considers key priority areas with the potential to address challenges around the world. Several initiatives have already been identified that will be launched over the short term to transform the Faculty's research approach into one that is globally visible.

These include, among others, determining the extent of the publication of the Faculty's research in high-impact journals in order to set achievable targets for the next five years, and developing research indicators to improve research outcomes and global rankings. Emphasis is also placed on the development of a research profile for all academic staff of the Faculty. These research profiles will focus on the productivity and quality of all EBIT researchers. Through TuksNovation, the Faculty's new business technology incubator, the idea is to start nurturing a culture of innovation, and specifically to bridge the chasm between research and innovation. In this regard, an incentive scheme will be developed for the participation and contribution of academics without necessarily compromising research outputs.

Prof Jan Eloff

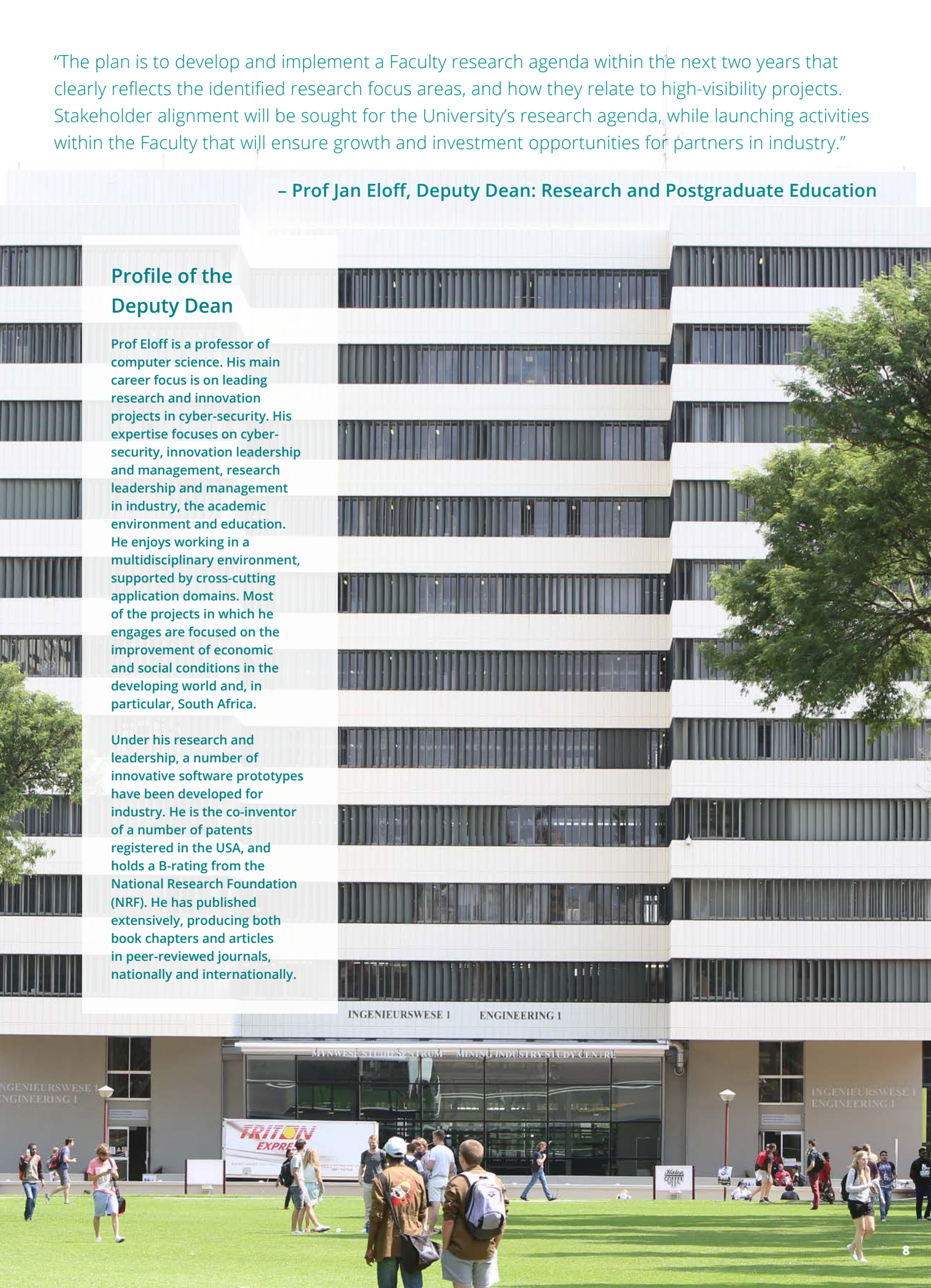
"The plan is to develop and implement a Faculty research agenda within the next two years that clearly reflects the identified research focus areas, and how they relate to high-visibility projects. Stakeholder alignment will be sought for the University's research agenda, while launching activities within the Faculty that will ensure growth and investment opportunities for partners in industry."

– Prof Jan Eloff, Deputy Dean: Research and Postgraduate Education

Profile of the Deputy Dean

Prof Eloff is a professor of computer science. His main career focus is on leading research and innovation projects in cyber-security. His expertise focuses on cyber-security, innovation leadership and management, research leadership and management in industry, the academic environment and education. He enjoys working in a multidisciplinary environment, supported by cross-cutting application domains. Most of the projects in which he engages are focused on the improvement of economic and social conditions in the developing world and, in particular, South Africa.

Under his research and leadership, a number of innovative software prototypes have been developed for industry. He is the co-inventor of a number of patents registered in the USA, and holds a B-rating from the National Research Foundation (NRF). He has published extensively, producing both book chapters and articles in peer-reviewed journals, nationally and internationally.



EBIT research strategy

Research synergy

The Faculty's research strategy has enabled the development of five core research focus areas. These, in turn, have enabled the deployment of several highly visible research and innovation projects. The research focus areas are defined as Big Data Science, ICT and Technology Innovation Management, Smart Cities and Transportation, Energy, Environmental Engineering (Water), and Minerals and Materials Beneficiation.

The research focus areas were determined by identifying existing pockets of research excellence, and function in synergy across the Faculty's departments and among researchers worldwide.

RESEARCH ENTITIES

- African Centre of Excellence in Information Ethics
- Carl and Emily Fuchs Institute for Micro-electronics
- Centre for Asset Integrity Management
- Centre for Connected Intelligence
- Centre for Electromagnetism
- Centre for New Energy Systems
- Centre for Nuclear Safety and Security
- Centre for Pyrometallurgy
- Centre for Transport Development
- Chair for Fluoromaterials Science and Process Integration
- Industrial Metals and Minerals Research Institute
- Institute for Big Data and Data Science
- Institute for Technological Innovation
- Mining Resilience Research Centre

2016 RESEARCH OUTPUTS

378,75

INDUSTRY CHAIRS

- SARChI Chair in Advanced Sensor Networks
- SARChI Chair in Artificial Intelligence
- Absa Chair in Data Science
- AEL Intelligent Blasting Chair in Innovative Rock Breaking Technology
- Anglo-American Chair in Pyrometallurgy
- Chair in Maintenance Engineering
- Chair in Nuclear Safety and Security
- Eskom Chair in Plant Asset Management
- Exxaro Chair in Energy Efficiency
- Glencore Chair in Pyrometallurgical Modelling
- Harmony Chair in Rock Engineering and Numerical Modelling
- Rand Water Chair in Civil Engineering
- Rand Water Chair in Mechanical Engineering
- Sedibeng Water Chair in Water Utilisation Engineering
- Sentech Chair in Broadband Wireless Multimedia Communication
- South African Council of Shopping Centres Chair
- Transnet Freight Rail Chair in Railway Engineering
- WEIR Minerals and Exxaro Chair in Maintenance Engineering
- Multichoice Chair of Machine Learning

EBIT RESEARCH FOCUS AREAS

WATER AND ENVIRONMENTAL ENGINEERING:

"As South Africa's economy grows towards that of an industrialised nation, environmental protection and water utilisation become critical success factors. The management of water quality and wastewater treatment therefore becomes increasingly important. This research focus area prioritises the periphery to produce fuel and oxygen from water and carbon dioxide using solar energy. The inquiry into engineered nanomaterials investigates how nanomaterials interacts with environmental and water systems."

MINERALS AND MATERIALS BENEFICIATION:

"In this research focus area, research is conducted to further the frontiers of the impact of science and engineering on the South African minerals value chain. This is done in collaboration with corporates, NGOs and government agencies representing the South African mining and manufacturing sectors. Chemical and polymer technology is a focus area and includes graphite in energy applications. Research in nanotechnology functions as a vehicle for the fourth industrial revolution."

SMART CITIES AND TRANSPORTATION:

"Smart cities in the 21st century are resilient and connected. The focus of the research conducted in this research focus area is on the co-creation of solutions with citizen communities so to achieve healthy urban systems. To achieve an outcome like this requires investigations into regenerative public space and building-integrated urban agriculture, among other things. Transportation focuses on the movement of vehicles and people, as well as the infrastructure required for things like pavement and rail engineering."

BIG DATA SCIENCE, ICT AND TECHNOLOGY INNOVATION MANAGEMENT:

"Research in this research focus area investigates innovative machine and statistical learning approaches to unlock hidden knowledge in big data sets. Exploring the broader field of information and communication technologies (ICT) includes investigations into enterprise architectures, artificial intelligence, cyber security, software engineering and education. Technology and innovation management focusses on the introduction of new products in order to secure the organisation's growth and sustainability."

ENERGY:

"Energy provision for all citizens of South Africa is vital to support quality of life. This includes the distribution, storage and utilisation of all energy resources. Researchers in multiple disciplines, such as material science, mechanical and aeronautical engineering, electrical and electronic engineering and chemical engineering, have contributed to efficient energy systems, renewable energy and the efficient utilisation of energy by end users."

Innovation champion

Inspiring the Innovation Generation

In its efforts to encourage innovation and excellence in research, EBIT is proud to associate itself with remarkable Faculty alumni. Prof Calie Pistorius, currently the Director and Principal Consultant at DeltaHedron in the United Kingdom, is one such alumnus. At UP, Prof Pistorius is most well known for his role as Vice-Chancellor and Principal of the institution between 2001 and 2009, and for his significant contribution to the success of the University during this period. Prof Pistorius was also a former Dean of EBIT and a former Head of its Department of Electrical, Electronic and Computer Engineering.

During his time as Vice-Chancellor and Principal of UP, Prof Pistorius initiated an institutional commitment to innovation by branding the University's student body as the Innovation Generation. In this regard, Prof Pistorius explains that, in order for countries to prosper and create an increasingly higher quality of life for its citizens, competitiveness is key. His aspirations for UP engineers and scientists was for them to have a thorough understanding not only of the technical and creative aspects of innovation, but also of the broader innovation process as it relates to invention and market exploitation.

The high premium that Prof Pistorius places on innovation and on instilling the spirit of innovation in researchers, resonates in both the University's and the Faculty's commitment to research excellence.

As an innovation champion, Prof Pistorius has inspired many researchers across the disciplines of engineering, the built environment and information technology. He currently focuses on the management of innovation through the assessment of the impact of inventions, strategic business opportunities, risks and threats presented by emerging technologies, and the dynamics of technological change.

Research support

The University deliberately balances its focus on research and innovation, and the partnerships fostered by creating an environment that is conducive to scholarly pursuits. This is an integral part of its long-term strategic plan, UP 2025.

Department of Research and Innovation

To support its postgraduate students, UP hosts the Department of Research and Innovation (DRI). The Department fulfills its role by integrating people, resources and opportunities that make it possible for researchers at every stage of their careers to develop and excel.

DRI supports postgraduate students with the following functions:

- Research capacity development
- Research grants management
- Innovation and contracts management
- Protection of intellectual property
- International cooperations
- Graduate support

To view the resources available through DRI, please visit www.up.ac.za/research-innovation.

Graduate Support Hub

To ensure positive research training experiences that will lead to relevant and high-quality research outputs, DRI hosts the Graduate Support Hub (GSH). The services provided by the GSH include the identification of an appropriate postgraduate degree and research supervisor, notifications of funding opportunities and skills workshops.

Research supervision

Each department in the Faculty provides research supervision to its postgraduate students from within its own research teams. Students work closely with their assigned supervisors, which promotes excellent research relationships. The staff members assigned to students as supervisors are discipline experts with the ability to provide high-quality research supervision.

Postgraduate students should identify where their research interests lie in relation to the research opportunities within each one of EBIT's 14 academic departments. Opportunities also exist within the Faculty's many research entities and industry chairs.

Admission requirements

To find a postgraduate degree programme that you believe will fulfill your needs, please peruse the yearbooks of the Faculty of Engineering, Built Environment and Information Technology on UP's website. Here, you will also be able to find the admission requirements and application process for each degree programme.

To view the EBIT yearbooks, please visit the following address:
www.up.ac.za/yearbooks/home

Applications for study at UP are conducted online at the following address:
www.up.ac.za/en/online-application

Information regarding funding opportunities is available at the following address:
www.up.ac.za/fees-and-funding

Information regarding the general rules and regulations of UP is available at the following address:
www.up.ac.za/en/postgraduate-students/article/257325/general-regulations-and-rules

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