

FEBE 2018 ANNUAL REPORT

Faculty of Engineering and the Built Environment

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1 OPERATING CONTEXT, GOVERNANCE AND RISK MANAGEMENT

1.1 Operating context



Image 1: FEBE Executive Dean – Prof Daniel Mashao

The University of Johannesburg's (UJ) Faculty of Engineering and the Built Environment (FEBE) houses one of the largest engineering student populations in South Africa, with a total headcount of 9 837 in 2018 (HEDA, 31 January 2019).

Logistically, the Faculty spans three campuses located at Auckland Park Kingsway (APK), Auckland Park Bunting Road (APB) and Doornfontein (DFC). With a faculty this large, FEBE also therefore comprises 12 individual academic departments, one postgraduate school, six research centres, two technology stations and one institute.

The Faculty offers a wide-ranging array of engineering and engineering-related academic programmes, which can be broadly grouped into three major categories: Engineering Science programmes, Technology programmes and the Postgraduate School of Engineering Management.

The Engineering Science programmes are located on the Auckland Park Kingsway Campus. The Engineering Technology programmes are located on the Doornfontein Campus. In 2018, both the Department of Quality and Operations Management and the Postgraduate School of Engineering Management were located on the Bunting Road Campus. The Department of Quality and Operations Management moved to the Doornfontein Campus as of January 2019. This is logistically more efficient since all their teaching occurs on this campus. In addition to the various Departments, the Faculty also adopts a School structure, which allows room for inter-departmental support, resource sharing and academic oversight via the Head of School. The School structure therefore links disciplines of a similar nature. To that end, FEBE has four schools, namely: the School of Civil Engineering and the Built Environment; the School of Electrical and Electronic Engineering; the School of Mechanical and Industrial Engineering; and the School of Mining, Metallurgy and Chemical Engineering.

These academic structures are in turn operationally supported by two Faculty Administrative Offices based on each of the Auckland Park and Doornfontein campuses. A postgraduate faculty office is also located on the Auckland Park Campus, offering postgraduate administrative support.



Figure 1: Faculty Organogram (as at April 2019)

1.2 Governance structures

FEBE remains governed by four main committee structures. The academic composition of these committees ensures the academic integrity of both undergraduate and postgraduate programmes. Support units and individuals are invited to these committees to ensure the efficient operation and implementation of the programmes.

The committees include the Technology Programme Committee (TPC), which caters for undergraduate technology programmes, and the built environment and management programmes. The Engineering Science Programme Committee (ESPC) caters for undergraduate engineering science related programmes. Further to this, the Faculty Higher Degrees Committee (FDHC) caters for postgraduate programmes, and the Faculty Research Committee (FRC) caters for all research related items. Supporting these Faculty-level structures, School research committees support strategic postgraduate initiatives.



Figure 2: FEBE Governance Structures

1.3 Quality Management

In addition to the internal UJ promotion of quality structures, programmes offered by the Faculty are also endorsed and accredited by five independent and external professional accreditation bodies. These professional affiliations offer FEBE students the opportunity to obtain professional registration with these bodies, after their studies. The professional bodies associated with FEBE are the Engineering Council of South Africa (ECSA); the South African Council for Planners (SACPLAN); the South African Geomatics Council (SAGC); the South African Council for Project and Construction Management Professions (SACPCMP); and the South African Council for the Quantity Surveying Profession (SACQSP). These professional bodies have not only proved to enhance the quality of FEBE's programmes but have also helped to ensure the international standard and rigour of the Faculty's undergraduate professional programme offerings in line with the UJ global excellence and stature (GES) vision.

In anticipation of the accreditation visits in 2018, the Faculty undertook an internal mock accreditation exercise from 19-26 March 2018, which was chaired by the relevant Heads of Schools. This exercise took place well prior to the visits and formed an integral role in the quality assurance process. Key deficiencies and concerns were strategically addressed and resolved prior to the actual visits. In addition, the Faculty worked closely with the Centre for Academic Planning and Quality Promotion (CAPQP), which offered oversight regarding evidence compilation and the drafting of reports.

Three of the five professional accreditation bodies visited FEBE in 2018. The SACPLAN visit took place on 2 May 2018, yielding positive outcomes for both the National Diploma in Town and Regional Planning and the Bachelor of Technology in Town and Regional Planning. The ECSA accreditation visit took place from the 30 July to 3 August 2018 and resulted in the full accreditation of the three diploma and four degree programmes that were revisited. In addition to this, the ECSA team also provisionally assessed the suite of new Bachelor of Engineering Technology programmes (BEngTech), then in their second year of implementation from 2017. The eight new programmes received interim provisional accreditation. The next regular accreditation visit will take place in 2020, following on the graduation of the first cohort of Bachelor of Engineering Technology students.

The Department of Mining and Mine Surveying was also visited by the SAGC from 8-9 November 2018. The programmes reviewed included the Diploma in Mineral Surveying and the Bachelor of Technology in Mineral Resource Management. Both programmes received full accreditation for three years. The SAGC team also endorsed the Department's new Bachelor of Mine Surveying degree, then in its second year of implementation.

1.4 Faculty Risk

FEBE actively monitors various risks included in the Faculty's Risk Register, which appears as a standing item on the Faculty Executive Committee (FExco) agenda. The major risk identified in 2018 related to the potential loss of professional accreditation for the majority of FEBE programmes, specifically in 2018. Not receiving accreditation for FEBE programmes has consistently featured as a major risk for FEBE in previous years.

The Vice-Dean: Teaching and Learning, Prof Esther Akinlabi, offered direct oversight to mitigate this accreditation risk. Given the high number of undergraduate programmes being reviewed in 2018, a number of strategic and administrative support interventions proved crucial towards eliminating and preventing the risk. Monitoring and evaluation of the accreditation preparation process were therefore actively reported on at the FEBE Exco, ensuring consistent and continuous management of the risk.

The positive outcome of all accreditation visits in 2018 could be attributed to the collaborative, collegial and supportive attitude of all FEBE academic staff and leadership involved. The cooperation of the departments and faculties that host FEBE's service modules also proved critical to the success of the accreditation process. In addition, both support and administrative staff contributed towards the success of the various accreditation visits.

FEBE's renewed strategy, over the last five years particularly, has been one of growth in terms of academic and research performance. As trends indicate, FEBE's growth strategy has extended to a number of key areas in line with the strategic plan of the University. These include, but are not limited to, growth in Science Engineering and Technology (SET) programme offerings, postgraduate student enrolment and international reach.

2 STRATEGIC FOCUS AND TARGETS

FEBE has strategically aligned its collaborative pursuits (both local and international), towards the fulfilment of the National Development Plan and the United Nation's Sustainable Developmental Goals. In this way, the Faculty has ensured that the collaborations pursued contribute to tangible changes towards the attainment of the sustainable development goals. All goals, strategies and thereby initiatives and key projects of the Faculty are linked in some way to the broad strategic goals of UJ. In this way, alignment and strategic support ensure that the higher-level strategies are achieved from the ground up. This also ensures that the staff in the Faculty are acutely aware of and participate towards the attainment of the University's strategy.

The strategic objectives of FEBE are aligned with the University's six global excellence and stature (GES) strategic objectives. FEBE has demonstrated increased contributions toward each of the strategic objectives of the University in recent years.

To assist with this, the Faculty's break-away sessions was held twice a year, which focused on the planning, target-setting and contributions of various FEBE departments, towards each of the Strategic Objectives of the University. The picture that follows, illustrates FEBE's recent achievements, challenges and strategic initiatives in fulfilment of the mission, strategic plan, goals, objectives and major drives of the University.



Image 2: FEBE 2019 FExC0 Break-away Session (24-25 January 2019)

2.1 Objective 1: Excellence in research and innovation

The Faculty actively promotes a culture of excellence in research and innovation. In 2018, FEBE was home to 39 rated researchers and 61 postdoctoral fellows. FEBE's drive towards increasing its research footprint can be illustrated by the growing number of publications FEBE has annually produced. FEBE academics have continued to actively participate in various conference panels, as reviewers, session chairs and organising committees of local and international conferences.

FEBE Schools have also successfully hosted international peer-reviewed conferences, extending the Faculty's research footprint and impact globally. FEBE's research output units submission status was 554.99 units, thus an achievement of 111%, 11% above the 2018 planned target of 500 units (as at 5 May 2019).



Figure 3: Proportion of Units submitted per Faculty (as at 5 May 2019)

In addition to the research culture of staff, FEBE's strategic intent to grow postgraduate enrolment numbers is illustrated by the significant increase in the number of postgraduate registrations. Notably, the postgraduate headcount enrolment grew from 979 in 2017 to 1 482 in 2018 (HEDA, HEMIS 31 January 2019). Despite the challenges of increased workload, given the phasing out and phasing in of new programmes, FEBE has successfully contributed towards the research objectives of the University. The Faculty is also cognisant that research-led teaching proves beneficial towards both research and innovation and teaching and learning.

FEBE Rated Research	ners		
Surname	Initials	Title	Department
Ahmed	NA	Prof	Mechanical Engineering Science
Aigbavboa	СО	Prof	Department of Construction Management & Quantity Surveying
Akinlabi	ET	Prof	Mechanical Engineering Science
Akinlabi	SA	Dr	Mechanical & Industrial Engineering Technology
Connell	S	Prof	Electrical & Electronic Engineering Science
Dundu	м	Prof	Department of Civil Engineering Science
Dzobo	OS	Dr	Electrical and Electronic Engineering Science
Edwards	DJ	Prof	Construction Management and Quantity Surveying
Ekolu	SOE	Prof	Department of Civil Engineering Science
Fatoba	OS	Dr	Mechanical Engineering Science
Ferentinou	MF	Prof	Department of Civil Engineering
Gupta	к	Dr	Mechanical Engineering
Jalama	к	Prof	Department of Chemical Engineering
Jen	TCJ	Prof	Department of Mechanical Engineering Science
Limebeer	D	Prof	Electrical & Electronic Engineering Science
Lo Giudice	А	Prof	Department of Quality and Operations Management
Marwala	Т	Prof	Research, Innovation, Post Graduate Studies and the Library
Mbohwa	С	Prof	Department of Quality and Operations Management
Moothi	К	Prof	Department of Chemical Engineering

Table 1: FEBE Rated Researchers (as at 19 Feb 2019)

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Mulaba-Bafubiandi	AF	Prof	Department of Mining, Metallurgy and Chemical Engineering
Musakwa	W	Prof	Town and Regional Planning
Nicolae	DV	Prof	Department of Electrical and Electronic Technologies
Ntuli	F	Prof	Chemical Engineering Technology
Nwulu	NI	Dr	Electrical and Electronic Engineering Science
Oke	AE	Dr	Construction Management and Quantity Surveying
Olubambi	PA	Prof	Chemical Engineering Technology
Ouahada	К	Prof	School of Electrical Engineering
Pilusa	TJ	Dr	Process Energy & Environmental Technology Station
Pradhan	А	Dr	Quality and Operations Management
Pretorius	JHC	Prof	Postgraduate School of Engineering Management
Scholz	MS	Prof	Civil Engineering Science
Sinha	S	Prof	Department of Electrical and Electronic Engineering Science
Sun	Y	Dr	Electrical & Electronic Engineering Science
Swart	TG	Prof	Department of Electrical and Electronic Engineering
Thwala	WD	Prof	Construction Management and Quantity Surveying
Von Solms	S	Dr	Department of Electrical and Electronic Engineering Science
Wang	QG	Prof	Institute for Intelligent Systems
Xing	BX	Prof	Institute of Intelligent Systems

2.1.1 Research that matters: Departmental Contributions

• Process, Energy & Environmental Technology Station (UJ-PEETS)

The primary mandate of the Process, Energy & Environmental Technology Station (UJ PEETS) is to contribute towards improving the competitiveness of industry and SMEs through the application of specialized knowledge and technology development and facilitating the interaction between industry (especially SMEs) and academia to enable innovation and technology transfer to grow the green economy. There are close linkages between the production and usage of energy and water, and consequently generation and disposal of waste. UJ-PEETS endeavours to promote crossdisciplinary knowledge transfer that supports the development of the green economy by building on relationship with researchers and developing networks within the UJ and the South African National System of Innovation (NSI) as it relates to sustainable development in the energy-water-waste nexus.

The focus is on Process Optimization, specifically in the energy and environmental sectors that supports circular 14.0 business strategies. In the Energy Sector, our focus is on energy efficiency and renewable energy solutions, waste-to-energy conversion, microgrids and energy storage, supported by data driven decision making and industry 4.0 business process optimisation. In the Environmental Sector, the focus is on waste utilisation and optimization, air quality management, water quality and quantity management, water loss management in distribution systems, and water purification.

UJ-PEETS, through its focus on Energy, Water and the environment, support the implementation of Industry 4.0 demonstration projects that contributes towards combatting climate change, supporting water security and mitigating air pollution. UJ-PEETS, through a project-based approach has partnered with several research centres in this regard by supporting the establishment of accredited laboratories, by supporting equipment and research funding applications, and creating partnerships with Industry and the NSI to collaborate on both R&D and implementation projects. In 2018 UJ PEETS provided engineering services to 140 SMEs in 2018 who operate in the green economy.

WATER Johannesburg Water Project

SERVICE OFFERED

water conservation and demand management optimization in the Johannesburg water corporate space

DELIVERABLES

Provide IT solutions for water loss management and automated water balancing (non-revenue water) structure. The key performance deliverables set include:

- Hardware and Software design for automated water loss management and automated water balancing (NRW).
- · Identify and acquire as-built drawings for the pilot discreet zones.





Image 3: UJ-PEETS Johannesburg Water Project

• Metal Casting Technology Station (UJ-MCTS)

In 2018 UJ-MCTS in collaborations with IK4-Azterlan had successfully assisted one local foundry in building capabilities to locally manufacture Axle box AND traction centre for the PRASA-Gibela project of building 600 trains as part of the refurbishment and replacement campaign of the current rolling stock. In this process the local foundry is able to manufacture the products which were previously exported, this contributes to the localisation strategy as a drive to create more jobs with the country. In addition, the samples of these products will be tested at the University of Johannesburg Physical Metallurgy, as part of continuous development.



Image 4: Image of Axle Box (left) and the Traction Centre (Right).



Image 5: New Rail Fleets for localisation programme (Source:Gibela-rail.com)

The UJ-MCTS developed modernised aluminium furnace for rural foundries which was transferred to six enterprises in Limpopo province. The modernised furnace provide an increase in productivity of melting, reduce raw material usage such as coal which minimises emissions and also increase the profitability of rural foundries. uses solar systems blower. This intervention fulfils the key policy imperatives: Building small business ecosystem that assist and promote rural entrepreneurs. The project was fully funded by the National Foundry Technology Network(NFTN) an Initiative of the Department of Trade and Industry (the DTI).



Image 6: Image of traditional aluminum melting furnace (left) and the modernised aluminum melting furnace (Right)

2.2 Objective 2: Excellence in Teaching and Learning

Excellence in teaching and learning has been achieved through maintaining an appropriate and diverse enrolment profile and by tailoring the Faculty's intellectually rigorous curricula in response to the key strategic objectives of the University.

The Faculty's strategic change in direction, target audience and programme offerings progressed in 2018, via the Faculty's phase-out plan. Diploma programmes from all departments, excluding the Department of Quality and Operations Management, enrolled their last first-year intake in 2016. Given the expiration of ECSA accreditation in 2020, strategies were explored and implemented to encourage programme completion by 2020. The duplicate teaching load comprising the teaching-out of old programmes and the teaching-in of new programmes simultaneously, has proved to be a challenging yet achievable feat for the Faculty.

In an effort to enhance and grow excellence in teaching and learning, FEBE has actively encouraged and supported initiatives in the Scholarship of Teaching and Learning. Specifically, two writing workshops were held with academic staff seeking to publish in teaching and learning. In addition, the Faculty sponsored the attendance of six academic staff members at a South African Society for Engineering Education workshop on curriculum development. The Faculty also sponsored the attendance of academic staff members at each of four Engineering Education 'master classes' on topics that included peer learning and assessment.

The Faculty produced numerous research outputs in the area of the scholarship of teaching and learning. These equated to over 10 DHET-accredited units. Various staff members within FEBE collaborated on the publication of a book on projects as socio-technical systems within engineering curricula. FEBE at UJ is involved in three NRF or DHET-funded teaching and learning projects, all involving collaboration with other universities in South Africa as well as in Sweden, the UK and the USA. FEBE's Dr Zach Simpson was appointed as Editor-in-Chief of the *SOTL in the South* journal. Associate Prof Johnson Carroll has also continued to serve as Vice-President of the South African Society for Engineering Education.

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In support of excellence in teaching and learning, the Faculty has also instituted a number of strategic initiatives aimed at holistically supporting student success.

2.2.1 First Year Seminar (FYS)

The 2018 academic year saw FEBE continue to run its own First Year Seminar involving new firstyear students registered in the Faculty. The FYS not only allowed for interaction between staff and students within the Faculty, but also fostered close linkages between the FYS and the formal engineering curricula. During the FYS, students were engaged in various activities, broadly grouped into three categories (literacy, mathematics and computer skills), and these activities were directly related to aspects that would be covered in subsequent modules. The FYS served to introduce students to their chosen engineering programmes while simultaneously assisting with the development of the academic practices necessary for success in Higher Education.

2.2.2 Tutorship and mentorship

Over 450 tutor appointments were made across the Faculty to assist in teaching and learning. These tutors are appointed to work with students in particular modules. The vast majority of modules in the Faculty included tutors as a vital part of teaching and learning. The budget for tutorship received by FEBE in 2018 was R1 900 000 in the Faculty tutor fund, while an additional amount of almost R1 200 000 was received from the Academic Development and Support unit, through the GES Senior Tutor Fund and the Strategic Tutor Fund.

2.2.3 FEBE Writing Centre

In 2018, FEBE continued to operate the FEBE Writing Centre. The Centre offers individualised support and instruction regarding all aspects of academic writing in engineering. The FEBE Writing Centre offered two writing workshops within the first-year module on the Introduction to Engineering Design. In addition, the Centre ran a series of eight workshops for fourth-year students who were undertaking their final-year research and/or design projects. These workshops were formally integrated into the final-year capstone project undertaken by the electrical engineering students. The FEBE Writing Centre also continued to offer a writing support initiative where the writing consultants partner with several undergraduate research

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project supervisors to offer intensive and continuous writing support to final-year students during their research project. This includes offering regular individual supervision of the entire research report writing process.

2.2.4 FEBE task team on Decolonisation

As part of the Faculty's commitment towards improved teaching and learning, the FEBE task team on decolonisation, in coordination with FEBE Marketing, presented the first FEBE Essay Competition on Decolonisation of the Engineering Curriculum (DeCon-FEBE 2018). The competition sought to engage the perspectives and broad insights of both students and staff, in relation to the constraints and limitations of graduates of African universities. An awards ceremony was held for the presentation of the top ten essays. A special proceedings of the best ten papers of the Decolonisation Essay Competition 2018 was compiled and will be published by the task team in the near future.

- Successful series of Decolonisation public lectures with renowned speakers
 - > Engineering and the Future of Africa by Prof Arthur Mutambara
 - Decolonising Engineering some perspectives, through the lens of water by Prof Mike Muller
 - Uncertainties of Knowledge Scientism and Decolonization of Knowledge by Professor Sabelo J. Ndlovu-Gatsheni



Image 7: Prof Mutambara – Public Lecture on Engineering and the Future of Africa (23 April 2018)

2.2.5 Teaching that Matters: Some Departmental Contributions

- Students from the Department of Mechanical and Industrial Engineering Technology visited the Ford Motor Industry, BMW in Pretoria, NAMPO show in Bothaville, Eskom Drakensburg Pump Storage scheme and the Mining Exhibition show in Nasrec Johannesburg.
- To further enhance the learning process, Civil Engineering Technology students visited the Concrete Batch Plant.
- To enhance and bring to life the Teaching and Learning experience, the Department of Mining and Mine Surveying has introduced a Mine Simulation Project on the Doornfontein Campus.



Image 8: Mine Simulation Project

- UJ-PEETS is hosted in the Faculty of Engineering and Built Environment (FEBE) to leverage the skills from the faculty to link multi-disciplinary strategic partnership across the University. Academics and students provide their expertise as and when needed by the Station. Cross-faculty collaboration has expanded the support and knowledge transfer to SMEs from departments in Environmental Health, Humanities and the Johannesburg Business School. The UJ research and development (R&D) network has a strategic focus aligned to the UJ-PEETS mandate with experts in bio-energy and bio-fuels, air quality and emissions control, water quality management, waste management, renewable energy sources, and specialist in measurement and verification.
- UJ-PEETS employed undergraduate and post-graduate students on industry and SME projects to provide experiential work experience, applied research collaboration and supports the research output of various researchers through these partnerships. We have adopted a strategy to coordinate research through a post-doctoral fellowship programme linked to 14.0 and the circular economy in each of the focus areas at UJ-PEETS.

 UJ-PEETS has also supported the implementation and training of local young people support cloud-based technology to collect data on behalf of provincial government to inform policy and decision-making. In 2018 UJ-PEETS provided technology demonstration and training to 1145 external individuals to support skills development linked to the green economy.

TRAINING EPWP: Agri-Enviro Training

ENVISAGED IMPACT (BENEFIT OF THE END PRODUCT)

The skills transfer in organic agriculture, PGS and Biogas to EPWP will give the candidates the necessary skills and knowledge to build a successful garden and contribute to the development of agricultural projects linked to the municipalities. If EPWP where to receive further training and mentorship these candidates could be absorbed into the green economy with placement on developing farms. Skills transfer in the agricultural sector is hugely lacking at present. This training was a pilot project to see if this approach was a viable one to train EPWP in green skills starting with agriculture. With really great feedback and evaluations from the 125 candidates this program could potentially re envision skills transfer in government programs going forward.







Image 9: UJ – PEETS Agri-Enviro Training

2.3 Objective 3: International Profile for GES

The Faculty's strong international profile has been enhanced by the vast number of international students and members of staff that call FEBE home. FEBE staff have continued to build and form critical networks with the international communities within their disciplines, some leading to collaborative agreements and others leading to the development of joint academic programmes.

Together with its large complement of international staff, the sheer number of international students that FEBE consistently attracts and enrolls each year further strengthens the Faculty's international profile. In 2018, 1 227 international students registered in the Faculty, which

STUDENT Academic Year FTE FTE FTE TIU GRADUATES HEADCOUNT ENROLLED PASSED % PASS 2018 1 227 769.090 486.553 63.3 4 282.489 278 2017 914 78.7 440.386 346.428 1 825.068 187 2016 927 434.087 331.698 76.4 1 784.404 174 2015 793 362.128 261.817 72.3 1 479.325 139 2014 74.4 628 289.011 214.935 1 216.077 139

significantly contributed towards the institution's international registration target (HEDA, 30 April

Table 2: International student enrolment (HEDA, International Faculty Profile: 30 April 2019)

2019).

As is evident, FEBE's increase in international student enrolments has contributed significantly towards the international enrolment of the University at large. The increased output of international graduates has also enhanced the reach of the UJ brand, marketing FEBE beyond South African borders.



Figure 4: FEBE International Headcount Enrolments



Image 10: Africa by Bus 2018

In supporting UJ's vision to be an international university of choice, FEBE also planned and coordinated an Africa by Bus Outbound programme to Mozambique. Students were exposed to several institutions outside of South Africa, expanding the Faculty's global reach and impact. The Faculty also hosted an international student campus visit by 20 students from Virginia Tech, USA. In addition, FEBE was involved in the University of Pittsburgh Swanson School of Engineering Global Engineering Preparedness Scholarship programme (GEPS), which comprised 23 Pitts students and 10 FEBE students.

Throughout the year, FEBE also hosted a number of international speakers who lectured on pertinent issues affecting academia, such as decolonisation, the future of engineering, and Africa and new advances in technology. These engagements were well attended by both students and academic staff. All departments within the Faculty actively strive towards acquiring and maintaining strong international collaborations and partnerships. These relationships contribute significantly towards the Faculty's International Profile.

2.3.1 Departmental Contributions towards International Collaborations and Partnerships

- UJ PEETS is but one of the examples of collaboration with local and international institutions, to provide state of the art knowledge transfer, R&D projects and applied research projects. Partnerships with the following centres and researchers at UJ supports the implementation of Industry 4.0 projects and multi-disciplinary engagement internationally:
 - Clean Transport Research at the Faculty of Engineering and the Built Environment in collaboration with the International Council on Clean Transportation (ICCT) commissioned by Department for Environmental Affairs (DEA) and the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH
 - University of Glasgow on a British Academy funded project, Strengthening Urban
 Engagement of Universities in Asia and Africa (SUEUAA)
 - Namibia University of Science and Technology Innovation Design Lab (NUST-IDL) collaborating on last mile logistics and e-mobility solutions with TU Delft
 - Laurea University of Applied Science (LAUS) Finland on circular economy projects and business models enables by technology in the urban agriculture environment
 - Alchemia-nova GmbH Institute for innovative phytochemistry & closed loop processes cradle to cradle® community
 - Real time optimisation and mine planning with Resource Engineering at TU Delft Circular economy in mining Inputs for renewable energy applications in collaboration with the Institute for Energy Economics and Rational use of Energy -University of Stuttgart University to support research implementation projects linked to renewable energy mining inputs.
- Department of Mechanical and Industrial Engineering developed an MOU with the Chinese University of Hong Kong in Hong Kong China and Manipal University Jaipur in India.

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- Prof. Mulaba from the Department of Metallurgy, presented to both national delegations from Egypt and South Africa the status of the DST/NRF South Africa-Egypt Bilateral collaboration project on high sulfur and high resin coal processing and beneficiation. In addition, collaboration between VBS University/ Czech Republic was initiated at the COMAT 2018 4th International Conference in Pilsen with Dr Monika. Potential student and staff exchanges are expected, as well as research collaboration. Further engagement will take place at the METALS 2019 Conference in May 2019, Brno/Czech Republic.
- Postgraduate School of Engineering Management implements international joint supervision collaboration from England, USA, Australia, Austria.

2.3.2 List of FEBE Public Lectures with International Speakers (2018):

- Universities Making a Difference: Social Responsibility and Impact by Prof
 Professor Mativeng from University of Manchester
- Springer Nature Materials Nanotechnology Workshop by Dr Mayra Castro, publishing editor at Springer Applied Sciences Editorial Heidelberg, Germany
- 28 March 2018 Universities Making a Difference: Social Responsibility and Impact by Prof Professor Mativeng from University of Manchester
- 23 April 2018 Engineering and the Future of Africa by Prof Arthur Mutambara
- 07 May 2018 Thought of Future Manufacturing (MONOZUKURI) by Prof Yasuhiro Okamoto, Associate Professor, Graduate School of Natural Science and Technology, Okayama University
- 11 May 2018 Springer Nature Materials Nanotechnology Workshop by Dr Mayra Castro, publishing editor at Springer Applied Sciences Editorial – Heidelberg, Germany
- 15 May 2018 Decolonising Engineering some perspectives, through the lens of water by Prof Mike Muller PrEng CEng FSAICE FWISA MICE
- 01 August 2018 The Digital Clash of Civilisations by Stafford Masie
- 25 September 2018 Uncertainties of Knowledge Scientism and Decolonization of Knowledge by Professor Sabelo J. Ndlovu-Gatsheni

- 17 October 2018 Public lecture on Blockchain by Paul Mitchell
- A new perspective in Education and Research in Engineering Management –
 Impact of Big Data by Professor Kwai-Sang CHIN
- International student campus visit with 20 students from Virginia Tech, USA
- University of Pittsburgh Swanson School of Engineering Global Engineering Preparedness Scholarship program (GEPS) 23 Pitts students and 10 FEBE students

2.4 Objective 4: Student-friendly living and learning environment

Over the years, the Faculty has endeavored to upgrade its undergraduate teaching laboratories and audio-visual equipment. A number of student spaces have been successfully upgraded in 2018. As part of the ECSA accreditation preparation plan, the Faculty strove to ensure that student living and learning spaces were suitable, complying with health and safety regulations. Particularly the upgrading of Civil Engineering Technology venues at the Doornfontein Campus successfully concluded in late 2017/2018.

In addition to the above interventions, the new Makerspace Laboratory operated successfully in 2018. It is envisioned that pioneering technological initiatives such as these will grow and contribute further towards the Faculty's Fourth Industrial Revolution (4IR) initiatives.

The initiative currently:

- Supports the development of a user's critical thinking and problem solving skills through deliberate experimentation (providing an educational environment often not met in the classroom alone)
- Promotes innovation by encouraging students/faculty to explore fields/equipment outside their traditional university departmental 'silos'
- Encourages true innovation
- Encourages users to explore and get familiar with technologies they may never have been exposed to before providing new knowledge and the opportunity for the user to develop new marketable skills
- Facilitates interdisciplinary collaboration between the highest profile programmes at UJ to develop innovative research, products and services.
- Provides an experimental learning space for UJ academic staff to explore new teaching methodologies, including new pedagogical models that support active learning.
- Is a catalyst that promotes community educational outreach
- Contains an area that allows for 3-dimensional thinking and creativity, equipped with 3D scanners, printers and cameras so that users can bring their creativity to life.

2.4.1 Some Departmental Contributions

• The Department of Town and Regional Planning has set up a computer laboratory with 65 work stations, 30 computers at DFC, Buxton Building. Additional 35 more will

be purchased in 2019. 65 chairs were also purchased for the laboratory, 60 stools, 38 drawing boards were also procured for the dedicated studio.

• The Faculty was able to maintain and ensure health and safety compliance, which undoubtedly proved to enhance the teaching and learning environment. Laboratories also received due attention and were evaluated and updated in preparation for the accreditation visits. This was the case of laboratories in Civil Engineering Technology and Town and Regional Planning.



Image 11: Mine Simulation Project

2.5 Objective 5: National and global reputation management

FEBE strives to be a Pan-African centre of critical intellectual inquiry through extensive scholarship and balanced participation in knowledge networks both within and external to the continent. FEBE's global reach and impact is evident by the number of international staff and students the Faculty attracts.

On the local front, however, given the new stream of programme offerings, it has emerged that FEBE's re-branding process requires greater focus. FEBE's new role in the context of scarce skills development within South Africa, together with the new ECSA-related programme standards, appear unknown to the majority of potential students and to the industry. The Faculty has therefore intensified its focus on building and maintaining more integral relationships with industry and professional bodies. The need for more focused and strategic marketing initiatives was also evident.

Community and industry engagement still featured strongly on the FEBE 2018 calendar. A number of interactive student events enhanced the local and international standing and awareness of the Faculty and the discipline. The involvement of FEBE in the ECSA Engenius project through Prof Esther Akinlabi is another example of community engagement that enhances the reputation of the Faculty.

A women in Engineering and the Built Environment Luncheon was presented by WiEBE on 24 April 2018 under the theme 'bridging the gap between industry and academia'. The keynote speaker was by Mrs Welekazi Cele, Regional Director for Hatch South Africa (Iron ore).



Image 12: FEBE Vice-Dean Teaching and Learning at WiEBE Luncheon (24 April 2018)

2.5.1 Departmental Contributions

 UJ-PEETS plays a critical role in the development and implementations of communitybased projects. UJ-PEETS facilitate and manage projects as community-driven, applied research projects to support innovation-driven economic development in Africa and encourages an interdisciplinary, project-based approach to research and the promotion of community-driven, social entrepreneurship through technology innovation, digital enablement and commercialisation. The Technology Station has taken a project-based approach to build on the resources available in and to the University to achieve this. Social and commercial projects which connect communitydriven, interdisciplinary research across departments in various faculties are selected to enhance students' learning and benefit local communities and SMEs beyond the gates of the University. The broad themes supported by the projects implemented relate to access to clean water, sustainable energy sources, and food resilience (as supported by sustainable technology solutions). These themes are aligned to the global sustainable development goals with smart city development in mind. An integrated solution to co-create a system that enables an environment that encourages responsible research and social innovation requires a human-centred design approach which inevitably starts by identifying the SMEs/community and the stakeholders involved.

- The University signed an MoU with Gauteng Department of Infrastructure Development to train Extended Public Works Program participants in various skills. The Department of Civil Engineering Technology is the project owner.
- Prof. Mulaba was also invited to spend 6 months sabbatical at the Namibia University of Technology (NUST) where he was actively working with the UNESCO-Chair.
- The Department of Quality and Operations Management has re-convened the National Quality and Operations Management Forum. This involves peer institutions such as DUT, VUT, Unisa, TUT, CPUT, NMMU.
- The Department of Town and Regional Planning presented lectures in China and France. They have also developed partnerships with both local and international stakeholders such as the Austrians, Chinese, Swiss and local partners, the University of Venda, Stellenbosch University, North West University, Free State University.

2.6 Objective 6: Fitness for global excellence and stature (GES)

The Faculty has continued to enthusiastically adopt and utilise social media platforms as these allow for targeted and insight-driven promotional strategies. In an effort to increase FEBE's online presence, a YouTube channel has been created with 15 video uploads to date. Followers on Facebook have grown from 3 819 (in 2017) to 6 640 to date. All social media activity undertaken complies with the institution's social media guidelines. Insights indicate increased engagement levels with a niche user profile ranging from varying engineering disciplines, industry practitioners, sponsors, partners, students and staff. These avenues have proved critical towards growing FEBE's fitness for global competition and awareness.

In 2018, FEBE explored avenues for a centrally based Short Learning Programme (SLP) administrative centre. The Faculty intends to extend its reach and impact globally, with a growing pool of contact and online SLPs being developed. Taking these offerings globally required a strategic business plan and holistic Faculty strategy. An SLP committee was constituted to offer a reflective and consolidated review of systemic processes and approaches that could enhance the Faculty's fitness for global excellence.

2.6.1 Departmental Contributions

 UJ-MCTS in 2018 went through ISO 9001:2018 Quality Management system Certification and also SANAS 17025:2005 Laboratory. The MCTS successful fulfil the requirements of both certificates and were awarded by SABS for ISO 9001:2015 and also by SANAS for 17025:2005. Both certificates will help the MCTS to improve efficiency and increase customer satisfaction. The certification also brings credibility in advancing decisions in some of the key policy changes with the metal casting industry.



Image 13: Image of ISO 9001:2015 Certification (left) and ISO 17025:2005 Metallurgy and mechanical testing (Right).

 UJ-PEETS, through its focus on Energy, Water and the environment, support the implementation of Industry 4.0 demonstration projects that contributes towards combatting climate change, supporting water security and mitigating air pollution. UJ-PEETS, through a project-based approach has partnered with several research centres in this regard by supporting the establishment of accredited laboratories, by supporting equipment and research funding applications, and creating partnerships with Industry and the NSI to collaborate on both R&D and implementation projects.

The UJ-PEETS industry and SME application projects are leveraged to support:

- Industry 4.0 and business process optimisation, linked to government procurement and supply chain development;
- Youth employment strategies, training and skills development for I4.0; and
- Food resilience, agribusiness and the energy-water-waste nexus.
- The Department of Electrical and Electronic Engineering Technology attracted funding from various sources. Enhancing the Department's Fitness for Global Excellence, the

funding has primarily of consisted of equipment donations by Industry partners such as Schneider Electric, Ntamo Technologies and HCL.

3 EMPLOYEE PROFILE

As at 31 Dec 2018, the Faculty employed 267 staff members in total, comprising academic, technical and support staff. The various categories consist of 173 academic staff members, 51 technical support staff and 43 support staff. The staffing complement has slightly reduced since 2017, given a number of vacant positions at the end of the year; however, stability has been maintained at most levels.

Table 3: Academic Employee Profile by Category and Rank (HRIS as at 31 Dec 2018)

Academic	Research Professor	Professor	Associate Professor	Senior Lecturer	Lecturer	Assistant lecturer	TOTAL
DEP OF CHEMICAL ENGINEERING TECHNOLOGY	0	0	3	3	1	3	10
DEP OF CIVIL ENGINEERING SCIENCE	0	1	4	4	5	0	14
DEP OF CIVIL ENGINEERING TECHNOLOGY	0	0	1	3	6	1	11
DEP OF CONSTRUCTION MNGT & QUANTITY SURVEYING	0	2	1	1	4	1	9
DEP OF ELEC & ELEC ENG SCIENCE	0	2	5	6	1	1	15
DEP OF ELECTRIC ENG TECHNOLOGY	0	0	1	8	11	0	20
DEP OF MECHANICAL ENGINEERING SCIENCE	1	4	1	8	0	1	15
DEP OF MECH&IND ENG TECHNOLOGY	0	0	2	8	14	0	24
DEP OF METALLURGY	0	2	3	4	6	1	16
DEP OF MINING ENG&MINE SURVEY	0	0	2	2	10	0	14
DEP OF QUALITY & OPERATION MGT	0	1	1	3	4	2	11
DEP OF TOWN & REGIONAL PLAN	0	0	2	0	6	0	8
POST GRAD SCHOOL OF ENG MANAGEMENT	0	1	2	1	0	0	4
DEAN'S OFFICE	0	0	1	1	0	0	2
TOTAL	1	13	29	52	68	10	173

Table 4: Technical Support Employee Profile by Category and Rank (HRIS as at 31 Dec 2018)

Non Academic	Technical		Senior	Technical	Head	Station	
(Technical Support Services)	Assistant	Technician	Technician	Manager	Technician	Engineer	Total
DEP OF CHEMICAL ENGINEERING							5
TECHNOLOGY	0	1	0	1	1	2	
DEP OF CIVIL ENGINEERING							5
SCIENCE	2	1	0	1	1	0	
DEP OF CIVIL ENGINEERING							5
TECHNOLOGY	3	1	0	1	0	0	
DEP OF CONSTRUCTION MNGT &							0
QUANTITY SURVEYING	0	0	0	0	0	0	
							3
DEP OF ELEC & ELEC ENG SCIENCE	2	0	0	1	0	0	
DEP OF ELECTRIC ENG							5
TECHNOLOGY	0	3	0	0	2	0	
DEP OF MECHANICAL							6
ENGINEERING SCIENCE	2	0	0	0	4	0	
DEP OF MECH&IND ENG							3
TECHNOLOGY	0	1	2	0	0	0	
							14
DEP OF METALLURGY	3	5	3	1	1	1	
DEP OF MINING ENG&MINE							2
SURVEY	0	1	1	0	0	0	
DEP OF QUALITY & OPERATION							0
MGT	0	0	0	0	0	0	
							1
DEP OF TOWN & REGIONAL PLAN	0	1	0	0	0	0	
							2
DEAN'S OFFICE	0	1	1	0	0	0	
							0
TECHNO LAB	0	0	0	0	0	0	
	12	15	7	5	9	3	51
TOTAL							

Table 5: Administrative Support Employee Profile by Category and Rank (HRIS as at 31 Dec 2018)

Von Academic Support Services)	zxecutive Dean	⁻aculty Officer	'inancial Officer	²rogramme Advisor	lead of ⁼aculty	Co-ordinator	General Assistant	secretary	Administrator	Research Assistant	[otal
DEP OF CHEMICAL ENGINEERING TECHNOLOGY	0	0	0	0	0	1	0	0	2	0	3
DEP OF CIVIL ENGINEERING SCIENCE	0	0	0	0	0	0	0	1	0	0	1
DEP OF CIVIL ENGINEERING TECHNOLOGY	0	0	0	0	0	0	0	1	2	0	3
DEP OF CONSTRUCTION MNGT & QUANTITY SURVEYING	0	0	0	0	0	0	0	1	0	0	1
DEP OF ELEC & ELEC ENG SCIENCE	0	0	0	0	0	0	0	1	0	1	2
DEP OF ELECTRIC ENG TECHNOLOGY	0	0	0	0	0	0	1	1	0	0	2
DEP OF MECHANICAL ENGINEERING SCIENCE	0	0	0	0	0	0	0	1	0	0	1
DEP OF MECH&IND ENG TECHNOLOGY	0	0	0	0	0	0	2	1	0	0	3
DEP OF METALLURGY	0	0	0	0	0	0	0	1	1	0	2
DEP OF MINING ENG&MINE SURVEY	0	0	0	0	0	0	0	1	0	0	1

DEP OF QUALITY & OPERATION MGT	0	0	0	0	0	0	0	1	0	0	1
DEP OF TOWN & REGIONAL PLAN	0	0	0	0	0	0	0	1	0	0	1
POST GRAD SCHOOL OF ENG MANAGEMENT	0	0	0	0	0	0	0	0	1	0	1
DEAN'S OFFICE	1	11	1	1	1	1	0	1	4	0	21
TECHNO LAB	0	0	0	0	0	0	0	0	0	0	0
Total	1	11	1	1	1	2	3	12	10	1	43

With regard to transformation objectives, FEBE is a faculty that has embraced and striven for affirmative action through the preferred employment of designated candidates, where possible. Of the total new appointments made in 2018, 77% were designated candidates. Overall, the Faculty stands at 56% designated employees, 19% non-designated; international employees constitute 24% of the employee profile, with the remaining 1% comprising disabled employees (HRIS, 31 Dec 2018).

Subsequently, the Faculty Exco has prioritised increasing equity representation on the committee, with a composition of 73% designated members and 27% non-designated.

Category	Black	White	Total	Foreign Nat – Africa	Foreign Nat – Other	Total	Grand Total	Disabled	Black %	White %	Foreign Nat %	Disabled %
Academic Profile	74	40	114	47	17	64	178	2	41,11	22,22	35,56	1,11
Overall Support Profile	79	13	92	3	1	4	96	1	81,44	13,40	4,12	1,03
Combined Total	153	53	206	50	18	68	274	3	55,23	19,13	24,55	1,08

Table 6 : Staff Equity Profile by Race (HRIS as at 31 Dec 2018)

FEBE's dedication towards Employee growth and development is evident by the increasing number of staff qualifications planned for and achieved.

Table 7: Academic Employees' Qualification Profile

Faculty	Number of Masters qualification	Number of Doctoral qualifications
Faculty of Engineering and the Built	71	85
Environment		

4 STUDENT PROFILE, STUDENT SUCCESS AND EXPERIENCE, RELEVANCY AND IMPACT OF ACADEMIC PROGRAMMES

4.1 Student profile in subsidised academic programmes

The student profile has significantly shifted over time, with the Faculty attracting students with a much higher APS score and matric degree endorsement compared to previous intakes. The awareness of the new programmes has not been as strong and clear as anticipated; however, efforts to market these programmes, especially to educators and school-leavers, have commenced and will continue.

Table 8: Student Profile: Overview

	Student Headcount	FTE Enrolled	FTE Passed	FTE % Pass	Graduates
2018	9.834	4,714.2	3.833.5	81.32%	2,796
2017	9,398	4,443.0	3,661.5	82.41%	2,406
2016	9,604	4,468.9	3,693.7	82.65%	2,229
2015	9,109	4,178.6	3,397.2	81.30%	1,900
2014	8,663	3,774.6	3,016.7	79.92%	1,888
2013	7,595	3,298.3	2,652.7	80.43%	1,639
2012	7,409	3,239.9	2,474.0	76.36%	1,348
2011	7,534	3,208.5	2,490.6	77.62%	1,388
2010	7,148	3,333.8	2,458.6	73.75%	1,385
2009	7,725	3,513.9	2,629.6	74.83%	1,376

FTE: Full-Time Equivalent



Figure 5: Student Profile: Overview

FEBE's total student enrolment headcount for 2018 was 9 834 (HEDA, 23 April 2019). FEBE also received 236 Orange Carpet registrations in 2018. The year 2018 marked the second year of implementation for the new bachelor's degrees on the Doornfontein Campus. This suite of programmes included Bachelor of Engineering Technology programmes and Bachelor programmes in Construction and Town and Regional Planning. The rollout of these programmes marked a strategic shift in the student profile of the Faculty, which since 2017 has catered to degree students to a larger extent, with only the Department of Quality and Operations Management still catering to diploma students.

4.2 Student success and experience

The FEBE graduation count for 2018 stands at approximately 2 436 candidates for the various engineering programmes (HEDA, 5 March 2019). This is compared to 1 910 graduates, at the same time in 2017. The rise in the number of FEBE graduates could be attributed to the large number of students exiting the Faculty's phased-out technology programmes. In order to aid this transition, the Faculty has explored clearing unnecessary hurdles impeding student completion, without compromising the integrity of the programmes.

In addition, the student experience was enhanced by the efforts of a dedicated Faculty Student Advisor, who deals with challenges of student accommodation and subsistence. Particularly, given the current challenging economic situation experienced by the students, FEBE was able to assist a large number of students with external bursaries and funding. It has been noted, however, that this funding has significantly decreased in recent years.

However, students receiving NSFAS funding has remarkably increased in the last years, with 2, 688 receiving funding in 2018, (HEDA, Faculty Profile Report as at 24 April 2019).

YEAR	STUDENT HEADCOUNT	NSFAS RECEIVED
2018	9,834	2,688
2017	9,398	2,408
2016	9,604	1,125
2015	9,109	969
2014	8,663	952

Table 9: FEBE - National Student Financial Aid Scheme (NSFAS) STUDENT FUNDING

Staff-Student Ratios also impacts student success. FEBE has maintained consistency regarding these trends over the recent years. Blended-learning methodologies and innovative delivery methods have positively impacted in alleviating the strain of large class sizes.

Table 10: RATIOS: STAFF - STUDENT

	PER ACAD	STUDENT	RATIO	ACAD STAFF	FTE	RATIO
YEAR	STAFF	HEADCOUNT		FTE'S	ENROLLED	
	(A)	(B)	(B/A)	(C)	(D)	(D/C)
2018	186	9,834	1:53	243.84	4,714.24	1:19
2017	190	9,398	1:49	245.43	4,443.00	1:18
2016	175	9,604	1:55	197.96	4,468.95	1:23
2015	159	9,109	1:57	176.39	4,178.58	1:24

4.3 Relevancy and impact of subsidised academic programmes

By 2018, the Faculty had successfully submitted 13 Honours programmes, three Advanced Diplomas and three Postgraduate Diplomas for accreditation to the Council on Higher Education (CHE). These were meant to replace all non HEQSF-aligned programmes in the Faculty. In addition to this, eight new Master's programmes were also submitted. These programmes were designed to accommodate the Master of Technology phase-out scheduled for December 2019. It is therefore intended that these programmes ideally receive CHE accreditation by 2019, to enable implementation in 2020. Given these developments, the Faculty's offerings are now fully aligned to the Higher Education Qualification Sub-Framework (HEQSF).

In 2018, the Master of Sustainable Energy, the Master of Micro and Nano-electronics and two Master of Sustainable Mining (by Coursework and by research) programmes, received approval from the CHE. The Faculty awaits the SAQA registration numbers in order to implement the programmes as soon as possible. The Bachelor of Engineering Technology Honours in Mechanical Engineering, the Bachelor of Urban and Regional Planning Honours, the Bachelor of Engineering Technology Honours in Metallurgical Engineering, Bachelor of Engineering, Technology Honours in Chemical Engineering were also recently accredited by the CHE.

4.4 Non-subsidised academic programmes

The Faculty does not offer non-subsidised academic programmes, but does provide Short Learning Programmes (SLPs). In 2018, 13 new SLPs were developed and approved at Senate. These SLPs aim to develop the Faculty's third-stream income, while simultaneously catering to the direct continuous development needs and skill gaps of industry professionals. These SLP offerings can be found on the UJ website.



Image 14: FEBE Students: UJ Civils Society Annual Ball

5 COMMUNITY SERVICE, STAKEHOLDER ENGAGEMENT AND REPUTATION MANAGEMENT

FEBE participates in a number of community and stakeholder engagements throughout the year. In this way, FEBE actively maintains and build its societal and industry networks. In 2018, FEBE, in partnership with the Engineering Council of South Africa (ECSA), presented an Engenius workshop at the Lepono Primary School in Mathibestad, North West province. The workshop attracted 250 learners from ten poorly resourced and underserviced primary schools in and around the village. The learners were presented with an enriching programme of activities, which commenced with a visual and engaging presentation on the engineering profession. The event was supported by the Johannesburg Roads Agency.



Image 15: Engenius Workshop – May 2018

A presentation on Robotics made to learners increased the awareness of technology and innovation. Learners were encouraged to explore robots through basic training on how to build and programme robots. The learners further enthusiastically participated in the bloodhound car challenge, as well as a civil engineering-related competition. A diverse and dynamic team of 44 delegates from the University of Johannesburg, galvanised through FEBE Marketing with support from the Vice-Dean: Teaching and Learning, guided and motivated the learners throughout the activities.

UJ-PEETS, along with other FEBE departments have actively participated in a number of community-based projects. The extent of the Faculty's reach into society, with both teaching and research that impact daily lives, has been evidenced by the growth of these projects in recent years.



Image 16: UJ-PEETS Waste-to-Energy Project (Monde Primary School)

FEBE also participated in the Global SA MTN Career Day, which took place at the MTN Innovation Centre on 21 June 2018. The expo aimed to create opportunities for disadvantaged youth to realise the value of digital infrastructure for their future careers. FEBE's exhibition incorporated the innovative UJ hydrogen car, which was manned by four fully-geared students from the club.

In June 2018, FEBE Marketing organised and coordinated an on-campus career seminar, in partnership with the Australia South Africa Alumni Association. The seminar was conducted for 400 female learners from Letsibogo Girls Secondary School and Aurora Girls Secondary School. The partnership aimed to expose learners to the academic and non-academic entities of the institution. The event was supported by the Transnet Group Capital.



Image 17: Australia South Africa Alumni Association (ASAAA) Girls Seminar

FEBE's dedication towards school engagements has fostered community-driven projects and has created an awareness of the various facets of the engineering discipline among schoolleavers. FEBE also hosted an Engineering career talk at Orange Farm for matriculants and senior high school scholars from Jabulile, Raphela and Aha-thuto Secondary Schools. In addition, FEBE Marketing, in partnership with Ark of Nations, a youth-led NGO, facilitated a career guidance and motivational talk at lower quintile schools in Vhenda, catering to students at Maswie Secondary School, Tshiemuemu Secondary School and Mavhungu Andries Secondary School. Career talks were also held at Thusa Setjahaba Secondary School and others in association with Stretford Youth Development Hub.

Prof. Mulaba, from the Department of Metallurgy, has in his community engagement projects in Limpopo, through the Metal casting Technology Station (MCTS), which is an initiative of the Department of Science and Technology (DST) took an active part to the technology demonstration and handover at MTEA foundry in Indermark, Bochum, Limpopo. Here a newly designed heat efficient with reduced production lead time furnace (to less than 6 hours from the initial 12h00), was demonstrated and handed over to the rural foundry. This event had a strong support of the National Foundry Technology Network (NFTN), the Department of Trade and Industry (The dti), and the Council for Scientific and Industrial Research (CSIR). In addition

to the push to use macadamia nutshell as fuel material in these rural foundries, Prof. Mulaba is investigating the heat transfer and distribution in the newly designed furnace as the inner linings are modified. The heat stress as a thermal load on the linings is being modelled and predicted while the heat transfer and distribution within the crucible is predict as a function of varying heating materials ie fuels.

Both FEBE students and staff are actively encouraged and supported to engage various communities and industry stakeholders in order to build and grow the UJ brand.



Image 18: PENETRON UJ CIVIL Mozambique Tour 2018



Image 19: Africa by Bus Excursion to Mozambique



Image 20: UJ CIVIL WBHO Function



Image 21: Motshegofadiwa Primary School Visit

6 RESOURCE MANAGEMENT AND SUSTAINABILITY

The role of the FEBE Financial Business Partner was occupied by three individuals during 2018. The Faculty of Engineering and the Built Environment has achieved its budgeted income for 2018. The actual income, including investment income, was 100% of the budget. These results, however, do not include the processing of bad debt provision.

Table 11: Budgeted and actual expenditure in 2018

	Actual		Budget		
Department	Total salaryTotal otherexpensesexpenses		Total expenses	Total expenses	
	R	R	R	R	
Dean's Office: Engineering	11 269 119,13	793 784,64	12 062 903,77	14 849 502,65	
Department of Industrial Engineering Technology	3 823 604,29	170 341,45	3 993 945,74	3 815 474,64	
Department of Mechanical Engineering Technology	15 717 489,84	614 248,49	16 331 738,33	16 001 708,20	
Department of Engineering Metallurgy	8 058 353,85	224 217,01	8 282 570,86	5 914 244,40	
Department of Extraction Metallurgy	6 901 191,46	472 969,21	7 374 160,67	7 842 349,84	
Department of Mine Surveying	4 466 483,54	45 581,79	4 512 065,33	5 440 393,86	
Department of Mining	5 945 491,08	961 955,21	6 907 446,29	7 554 870,67	
Dean's Office: Faculty Administration	5 084 192,84	154 194,67	5 238 387,51	5 489 333,51	
Dean's Office: Faculty Marketing	593 464,40	284 941,05	878 405,45	1 021 969,77	
Vice Dean's Office: Engineering DFC	96 077,67	86 130,31	182 207,98	186 731,71	
Vice Dean: Research		150 023,26	150 023,26	101 039,21	
ENGINEERING MANAGEMENT	4 595 217,72	365 200,38	4 960 418,10	4 841 863,80	
Department of Civil Engineering Science	13 119 683,65	736 340,95	13 856 024,60	13 671 015,97	
Department of Electrical and Electronic Engineering Science	18 559 985,36	478 003,50	19 037 988,86	19 742 176,05	
FEBE IT Support	2 951 035,37	913 896,17	3 864 931,54	3 789 195,45	
Department of Mechanical Engineering Science	17 423 907,07	867 401,81	18 291 308,88	18 150 935,70	
Department of Construction Management and Quantity Surveying	7 270 738,97	434 590,71	7 705 329,68	8 628 699,06	
Department of Town and Regional Planning	5 238 778,20	1 870 986,16	7 109 764,36	6 646 497,18	
Engineering Education	205 049,29	121 638,80	326 688,09	392 136,69	
Chemical Engineering Technology and Design	7 712 036,62	787 592,37	8 499 628,99	8 711 103,36	
Department of Electrical Engineering Technology	15 902 226,68	2 306 736,76	18 208 963,44	18 797 692,20	
Department of Civil Engineering Technology	13 352 551,41	615 480,38	13 968 031,79	13 864 765,54	
School of Civil Engineering and the Built Environment	139 463,68	258 142,98	397 606,66	482 901,06	
School of Electrical Engineering	145 725,00	863 930,24	1 009 655,24	1 078 295,93	
School of Mechanical and Industrial Engineering	127 264,94	315 155,34	442 420,28	443 796,08	
School of Mining Metallurgy Chemical Engineering	156 821,54	460 395,18	617 216,72 594 178,4		
Department of Quality and Operations Management	8 226 135,39	416 888,52	8 643 023,91 8 226 186,5		
Engineering Technology for Schools		127 359,11	127 359,11	181 303,15	
Total	177 082 088,99	15 898 126,45	192 980 215,44	196 460 360,63	

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7 LEADERSHIP

FEBE has experienced a number of important changes in leadership during the 2018 academic year. The vacant posts of both the Executive Dean and the Vice-Dean: Teaching and Learning occurred in the same year. The Head of Faculty Administration also retired at the end of 2018. The Faculty has, however, maintained stability and momentum during these transitions. For a substantial amount of the year, the senior management roles of the Faculty were capably held by Acting Executive Dean, Prof Charles Mbohwa, and Acting Vice-Dean: Teaching and Learning and Learning, Prof Hennie Grobler.

The Executive Dean of the Faculty, Prof Daniel Mashao, was appointed in August 2018 and is currently supported by the Vice-Dean: Teaching and Learning, Prof Kasongo Didier Nyembwe, who began in this role in February 2019. Prof Clinton Aigbavboa still continues as Vice-Dean of Postgraduate Studies, Research and Innovation. The Head of Faculty Administration, Ms Elize Maas has offered assistance to the Faculty, post-retirement, until her replacement commences work in April 2019.

In addition to this, a vast number of FEBE staff have and continue to hold a number of key roles in academia and industry. These affiliations are evident of the depth of leadership and discipline expertise. The continuity, professionalism and depth of FEBE leadership have ensured that the Faculty has maintained its trajectory in line with the strategic objectives of the University.

8 CONCLUSION AND WAY FORWARD

The future journey for FEBE appears bright and exciting. Under the mantle of new leadership, FEBE embraces the future, armed with a new suite of undergraduate and postgraduate programmes, new SLPs and a very specific and strategic shift in direction. As such, FEBE is currently experiencing a state of transition, as staff and academics still straddle the challenges of phasing out the old programmes and implementing new ones.

Armed with the new strategy, the Faculty has committed itself to contribute towards a renewal and growth in the Science, Engineering and Technology (SET) sector. FEBE is therefore cognisant that it has the opportunity to re-brand itself as a key player in Engineering Education. However, it has also acknowledged the critical role that industry and professional bodies will play towards achieving the intended growth and sustainability of its programmes. FEBE's focus in the near future is therefore to integrate the strategic initiatives of the University with its own development and growth, which will ultimately lead to more innovative and progressive practices in both teaching, learning and research.

Mapping the way forward, the Faculty is committed to strategic renewal, the decolonisation of knowledge, new innovative research centres, as well as joint international research centres, focused mentorship, strategic leadership rejuvenation and a focus on a higher quality of publications. A key focus area for the future of FEBE remains the Faculty's growth and sustainability, given the new pool of undergraduate programmes. In addition, the Faculty has made strides to implement the University's postgraduate growth strategy and it is intended that the undergraduate pool of offerings will follow suit.

The Faculty is also committed to the strategic objectives of UJ, and looks forward to the incorporation of additional 4IR initiatives, increased dialogue and strategic projects in order to achieve them.

