UNIVERSITY OF JOHANNESBURG

The Future Reimagined

FACULTY OF ENGINEERING AND THE BUILT ENVIRONMENT

ANNUAL REPORT 2020

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1. INTRODUCTION

IMAGE 1: FEBE EXECUTIVE DEAN - PROF DANIEL MASHAO

The 2020 academic year was one associated with great challenges, disruption and opportunity. This was largely due to the global Covid-19 pandemic, which upended the notion of normal life, work and play. During these times of physical isolation and social distancing, teaching, learning and research in higher education called for ingenuity, adaptability and out of the box approaches.

The Faculty of Engineering and the Built Environment (FEBE) rose to this challenge, proving it housed the capability to be just that, by being

operationally adaptable and academically innovative enough to complete the 2020 academic programme as scheduled.

In addition to the pandemic, the Faculty has experienced a number of substantial changes. The 2020 academic year saw the shift from diploma offerings to degrees fully take place, with the majority of National Diplomas being successfully phased out. However, the year also saw the impact of this change play out in the 2020 enrolment trends. With non-aligned programmes reaching the conclusion of its phase-out cycle, the Faculty experienced a decrease in total headcount enrolments, from 10 183 in 2019, to 8 939 in 2020, (HEDA, 26 Feb 2021).

The anticipated decrease has largely been due to the phasing out of all National Diplomas (NDip) and Bachelor of Technology (BTech) programmes, both at the University of Johannesburg and nationally across the country. The expiration of professional accreditation for these programmes also encouraged students to finish professionally affiliated programmes more timeously.

The 2020 academic year was therefore categorised by the conclusion of the phasing out process. In turn, a large number of new programmes, meant to compensate for the phase-out, were introduced. Implementing a wide range of new programmes, fourteen (14) in total, mostly at the Advanced Diploma and Honours level, proved challenging and unchartered territory for the Faculty.

However, as a result of the success of this process, from early programme development to successful programme accreditation and timeous programme implementation, FEBE now houses all Higher Education Sub-Framework (HEQSF) aligned programmes, which offer complete articulation from the undergraduate to doctoral level.

In this way, FEBE has completed the national alignment project from the old higher education framework to the new higher education qualification sub-framework (HEQSF), quite successfully. This was accomplished with a hundred percent of the programmes submitted for the alignment, being accredited by the Council of Higher Education (CHE).

Along with the rest of the UJ community, FEBE has viewed the pandemic as more of an opportunity, than a barrier. Innovation, adaptable learning by both staff and students and a hard reset, has forced the Faculty to self-reflect, re-invent and plan for new pathways towards educating engineering and built environment students.

Despite hardships in 2020, both academic and support staff have risen to the occasion, working hard towards maintaining FEBE's standards of excellence, whilst also calming and catering to the needs of its students. Given the circumstances, FEBE has undoubtedly grown by embracing change, while looking forward to the innovative changes this experience will bring to the higher education sector.

2. FEBE GOVERNANCE

FEBE governance structures have maintained stability in the past year, ensuring academic oversight and programme quality as the year progressed. These committees comprise of the Technology Programme Committee (TPC) that governs the operational and academic quality of undergraduate technology, built environment and management programmes. The Engineering Science Programme Committee (ESPC) governs undergraduate engineering science related programmes.

Further to this, the Faculty Higher Degrees Committee (FDHC) governed postgraduate programmes whilst the Faculty Research Committee (FRC) governs all research related items. Supporting these Faculty-level structures, are School research committees which support strategic postgraduate initiatives. FEBE committees convened online to ensure the continued academic oversight and integrity of FEBE programmes.

FEBE's robust and well-functioning governance structures facilitated key decision-making processes undertaken in 2020 specifically, given the disruptiveness of the pandemic and its impact on the academic endeavor. The decisiveness, decision-making and oversight offered by such committees have proved to be an invaluable resource that steered the Faculty in the right direction, ultimately towards the successful completion of the academic year.

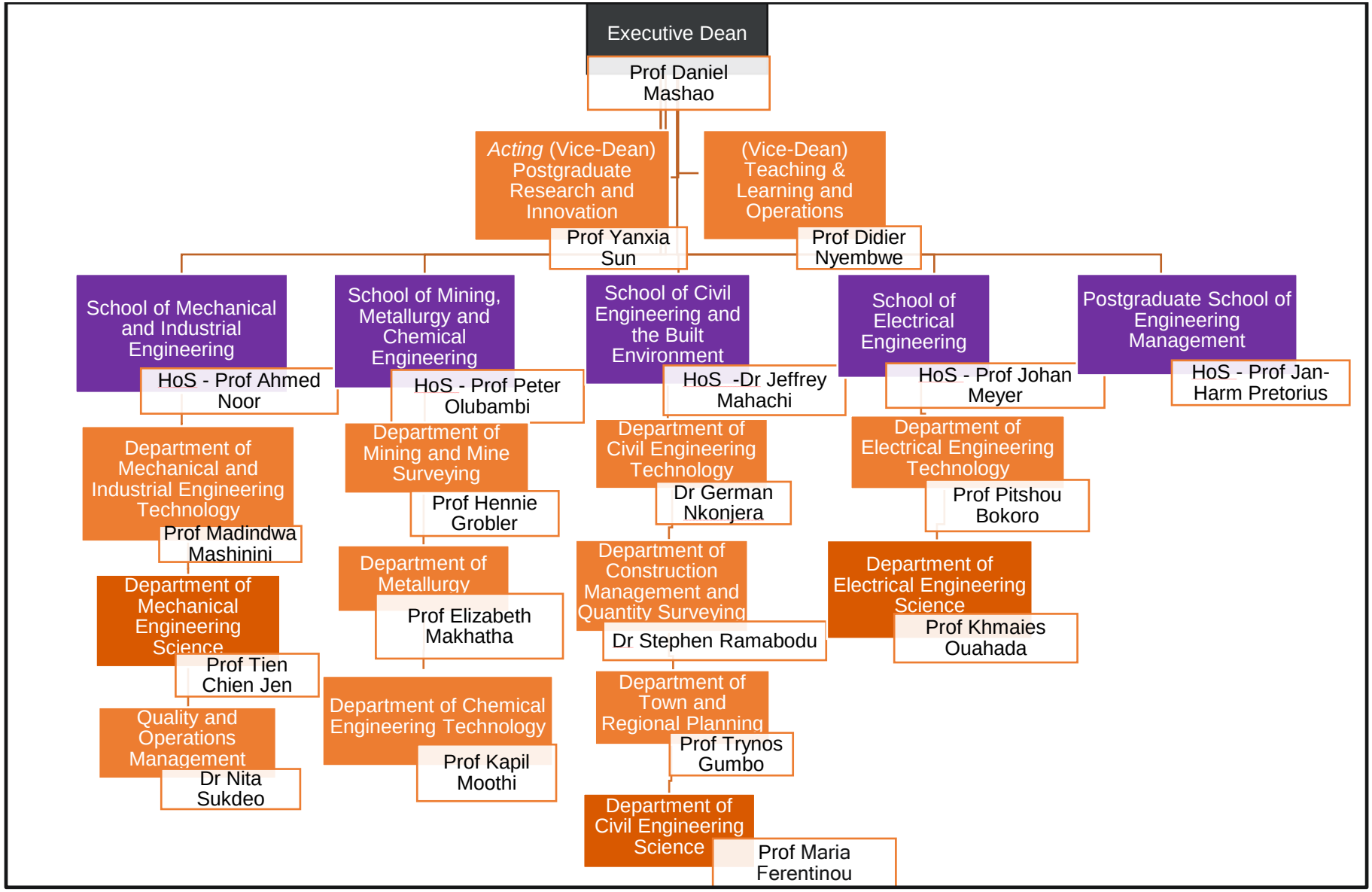


IMAGE 2: FEBE ORGANOGRAM - ACADEMIC SCHOOLS AND DEPARTMENTS (2020)

3. FEBE QUALITY MANAGEMENT

In addition to FEBE's sound governance structures, there are five (5) professional bodies associated with undergraduate programme accreditation, who enhance and maintain programme quality management in FEBE. These bodies include 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). Professional body visits and accreditation have proved to elevate the quality of FEBE's undergraduate programme offerings, confirming the academic integrity and global competitiveness of FEBE programmes.

IMAGE 3: FEBE PROFESSIONAL BODIES

Following the successful provisional ECSA accreditation visit in 2018, the Faculty undertook preparations towards the regular ECSA visit in 2020. However, given the sudden impact of the Covid-19 pandemic, all

accreditation visits scheduled for 2020, were postponed to 2021 or beyond. None the less, planning and preparation that was possible, continued during the 2020 academic year.

3.1 Accreditation Planning for 2021

FEBE prepared detailed accreditation preparation plans, in anticipation of five professional body visits that would take place in 2021, as a result of being postponed in 2020. These included the visits by ECSA, SACPLAN, SACQSP, SACPCMP and SAGC. Mock accreditation exercises, adequate accreditation training and the move to collating evidence on a central online Faculty platform (MS SharePoint) were included in the planning, and actioned in at the start of 2021.

In 2021, ECSA approved a new standard document for online programme accreditation (E-24-STA). This document defines the standards that are to be met by the engineering education providers in the design and delivery of online programmes. The document also covers the specific elements pertaining to accreditation criteria in the context of online delivery of engineering programmes. This ECSA standard was implemented in FEBE in the 2021 academic year.

The Online Standard suggests several improvements to the online teaching and learning from the 2020 experiment to maintain ECSA accreditation related to Criterion 3 and 4. In particular, assessment integrity issues under Criterion 3 on the effectiveness of Teaching and

Learning come to the fore especially regarding the online assessment of graduate attributes. Equipping departments with computer devices and required software under Criterion 4 on Resourcing and sustainability is also receiving particular mention and ongoing implementation in FEBE.

4. FACULTY RISK MANAGEMENT

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 2020 related largely to the potential loss of professional accreditation for the majority of FEBE programmes.

Professional Body Accreditation of FEBE undergraduate programmes has and continues to feature as a major risk for Faculty and is therefore monitored and supported by the executive management committee of the Faculty. Although no accreditation visits occurred in 2020, FEBE continued with its accreditation planning and preparation, anticipating the visits in 2021 or beyond.

In addition to the risk to the accreditation of programmes, FEBE also successfully managed the risk associated with the transition of contact learning to the blended approach to teaching and learning. Close monitoring of student progress, departmental engagement and feedback aided the process effectively, ensuring a relatively smooth transition from contact to fully online learning.

Another risk featuring prominently in 2020, centred on FEBE's enrolment deficit due to the swift phasing out of non-HEQSF aligned programmes. The Faculty enlisted the assistance of both UJ marketing and an external

marketing agency to help re-brand FEBE, given its shift in programme offerings, most of which were new. In addition to this, given that some new programmes had seen its first cohort of graduates in 2020, the Faculty undertook a review of programme entrance requirements, benchmarking against peer institutions. Some changes have been affected, and this process is ongoing as consultations with other invested faculties continue into 2021.

Staff recruitment, retention and development has also featured among the Faculty's risk. With the move away from diploma qualifications, the appropriate recruitment strategy is required to help support FEBE's new range of programmes.

5. STRATEGIC FOCUS AND TARGETS

The strategic objectives of FEBE are aligned to the six (6) strategic objectives of UJ. Despite the disruptive nature of the pandemic, FEBE's contribution towards the strategic objectives of the institution have been significant during the 2020 academic year.

5.1 Objective 1: Excellence in Research and Innovation

The Faculty actively promotes a culture of excellence in research and innovation. FEBE's drive towards increasing its research footprint can be illustrated by the voluminous number of publications FEBE has annually produced. FEBE academics have continued to actively participate in various research-driven projects, despite the restrictions associated with management of the pandemic. These restrictions included travel restrictions and limited access to campus.

FEBE's research output status currently stands at 541.81 units contributing towards a target of 650 units, (as at 07th May 2021). FEBE's 2019 research output performance surpassed targets by 136 %, and by 128 % in comparison to 2018 results.

TABLE 1: FEBE 2019 RESEARCH OUTPUT (RESEARCH OFFICE SUBMISSION, 30 JUNE 2020)

Final 2019 Research Output Units Submission as at 30 June 2020

	Final Submission (Units)					International		Performance against previous year			Performance against targets			
ACADEMIC DIVISION	Books	Chapters	Proceedings	Articles	2019 to date	% Int Articles	# Scopus Pubs	2018 submitted	2019 vs 2018 (units)	2019 vs 2018 (%)	2019 target	% inc/dec	2019 vs target (units)	% target achieved
College of Business and Economics	26.00	18.27	80.43	298.06	422.76	83	322	321	102	132%	340	6%	83	124%
Faculty of Art, Design and Architecture	9.00	7.21	4.08	13.16	33.45	90	8	78	-44	43%	80	3%	-47	42%
Faculty of Education	10.00	8.22	10.66	109.24	138.12	92	118	128	10	108%	140	10%	-2	99%
Faculty of Engineering and the Built Environment	33.67	11.18	259.32	411.87	716.04	99	635	560	156	128%	525	-6%	191	136%
Faculty of Health Sciences	0.00	1.05	5.65	79.93	86.63	87	108	70	17	124%	75	7%	12	116%
Faculty of Humanities	119.00	41.28	1.75	250.05	412.08	90	299	390	22	106%	420	8%	-8	98%
Faculty of Law	19.00	15.07	2.00	64.66	100.73	79	37	102	-1	99%	115	13%	-14	88%
Faculty of Science	8.75	5.63	17.37	396.92	428.67	99	757	395	34	109%	432	9%	-3	99%
Other (non-college/faculty, e.g. ADS, Library, etc.)	*0.00*	*0.00*	*0.13*	*0.63*	0.75	100	*0*	*4*	*-3*	*19%*				
TOTAL	225.42	107.91	381.39	1624.52	2339.23	93	N/A	2047	293	114%	2127	4%	211	110%

In addition this this, FEBE is also home to forty five (45) NRF rated researchers (1A; 5 B; 25 C; and 14 Y rated), with six (6) newly awarded in 2020.

FEBE's postgraduate enrolments also significantly contributed towards the Faculty's pursuit for research excellence. Postgraduate headcounts increased from 1 598 in 2019 to 2 038 in 2020. Whilst these high student enrolment numbers may present a challenge for supervision, the Faculty has been able to successfully supervise and graduate a high number of students in postgraduate programmes. Specifically, FEBE graduated 394 postgraduate students in 2020, the highest number of graduates in the past four years, (HEDA HEMIS Data, 26 Feb 2021).

Focused attention towards an increase in the Faculty's intellectual proprietary portfolio produced an additional three (3) new patents in the

Faculty. The Faculty was also able to secure external research income in the amount of R 44,015,191 as at Nov 2020.

Despite the challenges of the increased teaching workload, due to an additional third year of teaching in new Technology programmes, and teaching on new Honours programmes, FEBE has successfully contributed towards the research objectives of the University. The Faculty also remains committed to the strategy that research-led teaching proves more beneficial towards both research and innovation and teaching and learning.

FEBE research initiatives, such as the development of South Africa's first Atomic Layer Deposition (ALD) research facility, has been instrumental in catapulting FEBE's strategic 4IR trajectory. The team led by Prof Jen, comprises of Master's, Doctoral students, Industry (Picuson (ALD), Hydrox holdings and PEETS) and international collaborators such as Penn State University, Case Western Reserve University and Purdue University, Fudan University, Shandong University, Harbin Institute of Technology, University of Science and Technology and Northwest Polytechnical University.

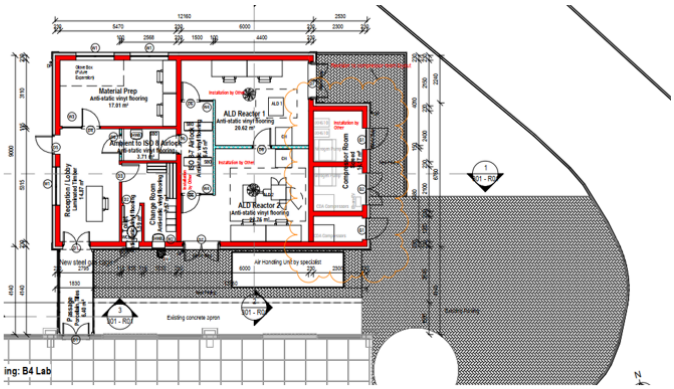
IMAGE 4: PROF JEN AND THE ALD TEAM

Facility

- 2 Picuson Reactor Laboratories
- Clean Room
- Material Preparation Room

Characteristics

- **CUTTING EDGE ALD REACTORS** facilitated in a top of the range **CLEAN ROOM LABORATORIES (ISO 7)**
- Operation in **RESEARCH SCALE** and **INDUSTRIAL SCALE**
- Plasma and Thermal ALD
- Designated ALD simulation room



Location: University of Johannesburg
Auckland Park
Johannesburg
South Africa

IMAGE 5: DEVELOPMENT OF SOUTH AFRICA'S FIRST ALD FACILITY

5.2 Objective 2: Excellence in Teaching and Learning

The impact of the Covid-19 pandemic was adequately addressed in FEBE. The Faculty's business continuity plan for academic activities ensured that the academic year 2020 ended on time, at the end of November 2020. FEBE has worked towards excellence in tailoring the Faculty's intellectually rigorous curricula in response to the key strategic objectives of the University and the country at large.

Given the current national response towards aligning programmes to the Higher Education and Qualification Sub-framework (HEQSF), teaching and learning initiatives have needed to be responsive, adaptable and flexible, whilst still maintaining a strong hold on academic integrity. FEBE's Teaching and Learning strategy therefore includes a number of cohesive initiatives that holistically support and guide both students and academics.

5.2.1 Teaching and Learning during Covid-19

The COVID-19 pandemic disrupted the 2020 academic year. Lockdowns of different levels (5 to 1) were imposed nationally to prevent the disease's propagation. As guided by the University, FEBE essentially adopted an online/blended teaching and learning strategy to save the academic year 2020.

To that end, all the teaching and learning materials (learning guides, lecture slides and notes and assessment question papers) were upload to the Blackboard Learning Management System (LMS). The Blackboard Communicate Ultra feature of the LMS was used for synchronous teaching to students following the Faculty's regular lecture timetables. Students engage with the learning materials asynchronously by remotely accessing the LMS. All the academic activities through the LMS were recorded and closely monitored by the Centre for Academic Technologies (CAT), with reports provided to faculties.

In addition to this, the Faculty of Engineering and the Built-Environment (FEBE) also largely followed the guiding principles to online teaching and learning during the Covid-19 as prescribed by the Engineering Council of South Africa (ECSA) in a document disseminated at the beginning of June 2020. These principles reiterated that all the four criteria of accreditation in the ECSA E-03-P policy had to be complied, even within the context of remote education.

In particular, FEBE ensured that the recommended total number of notional hours of programmes were not reduced, and that all the graduate attributes were assessed as per the ECSA E-02- PX policies. In the context of online teaching and learning, the Faculty adopted continuous assessment (CE) for all modules except for a few modules, and tutorship also moved to an online mode of delivery.

FEBE academic departments implemented various alternative methods to continue with practical and laboratory work. These methods, which were

endorsed by the ECSA Guiding Principles to Online Teaching and Learning during the Covid-19 pandemic document, included practical demonstrations, simulations and videos. During the second semester of 2020, commencing in July 2020, students were progressively allowed to return to the University to perform in-person practical work in the laboratories. Final year students were given priority to begin and catch up with their capstone projects.

In order to ensure that all students effectively participated in the online teaching and learning activities, the University carried out strategic interventions implemented and closely monitored in FEBE. These proactive steps to support remote instruction included:

- Zero Rating of UJ website, including access to Blackboard LMS through ULink.
- Provision of free WIFI data to students with double the amount to tutors.
- Provision of computer devices to vulnerable students (and tutors).

The impact of the Covid-19 pandemic was adequately addressed in FEBE. FEBE's Business Continuity Plan outlined the academic activities required, that were ultimately implemented by FEBE, to ensure the timeous completion of the 2020 academic year by November 2020.

Statistics on student performance within FEBE, which included module pass rates, saw the number of dropouts reduce during online teaching and learning in comparison to face-to-face delivery. The Faculty achieved an

overall undergraduate success rate of 85.7% during the academic year 2020, an increase of 1.7 % from the previous 2019 academic year.

The transition to online teaching and learning in 2020 due to the Covid-19 pandemic and the continuation of the education delivery in 2021 have proven to be an effective engineering education model. Despite its weakness compared to the face-to-face teaching and learning, in so far as the challenges related to practical and laboratory work are concerned, it is possible to provide quality engineering education that continues to meet professional body accreditation requirements and maintain excellence in quality teaching and learning.

5.2.2 Transition to Blended Learning

The use of technology is an important component of the University's Teaching and Learning strategy. The University has, over the years, invested in Blackboard as its preferred Learning Management System (LMS). Since 2018, the University has strongly moved towards blended Teaching and Learning, by requesting that all the learning guides and teaching materials be uploaded on Blackboard, to allow for asynchronous access by students. This strategic approach to Teaching and Learning has proactively prepared the University and the Faculty for the transition to fully online teaching and learning, at the onset and during the Covid-19 pandemic. During the latter period, full functionalities of the LMS were exploited including synchronous lectures, online assessments, grade centres and the early identification of academically at-risk students.

It is anticipated that by 2021, all modules in FEBE will be offered using a blended approach for the theoretical lectures, while the practicals and some assessments will take place in-person. The blended teaching and learning mode of delivery is also complemented by the use of recommended e-books. The Centre for Academic Technology (CAT) has negotiated free e-books for high priority index modules with external educational book suppliers. All modules in the Faculty were requested to recommend an e-book that could be accessed by students through the library services.

Other logistical support for students, during the inevitable move to blended teaching and learning, includes free Wi-Fi on campus, availability of computer centres in the Departments (e.g. Departments of Electrical Engineering Technology and Civil Engineering Technology), upgrade and modernisation of the library on the DFC campus and the provision of devices to vulnerable students.

The progressive implementation of blended Teaching and Learning approaches within FEBE has undeniably been a strong contributor towards the increase in pass rates of modules. Particularly, student module pass rates proved to be quite remarkable, at 85% in 2020.

5.3 Objective 3: International Profile for GES

FEBE has remained committed towards the internationalisation of its student population, staff and academic collaborations. FEBE significantly contributes the University's vision to be an international university of choice. In 2020, of FEBE's total headcount of 8 939, 1 165 were international students. Comparatively, FEBE attracts a larger contingent of international students, offering the Faculty the academic rigor associated with a diverse student population.

As a result of some international students being restricted from returning into the country, FEBE's smooth transition to online teaching ensured students were able to complete the academic year, despite their physical location at the time.

The geographical confinement associated with dealing with the pandemic, provided an opportunity for FEBE to seek, explore and make use of ample opportunities for global engagement via numerous webinars, online public lectures and expert talks. These events included collaboration with a number of international universities, offering talks by experts in the field of the Fourth Industrial Revolution, Covid-19 and its impact on the changing higher education environment. As a result of this, FEBE was able to diversify and broaden its international network, in its pursuit towards global excellence.

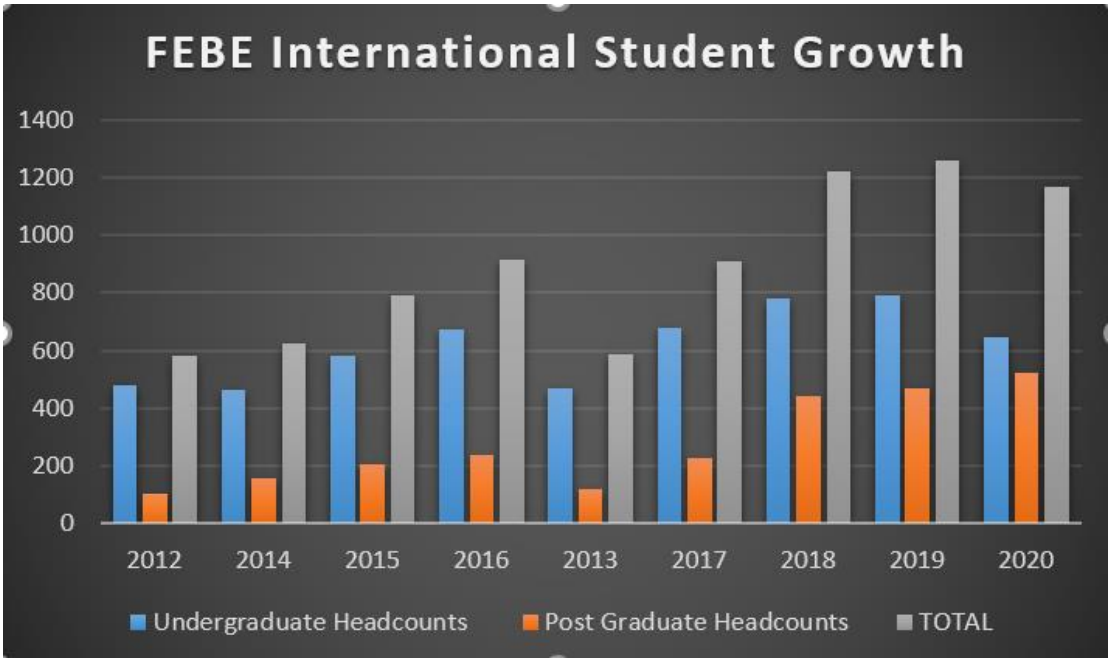


IMAGE 6 : INTERNATIONAL FEBE GROWTH (2012 – 2020)

5.4 Objective 4: Student-friendly Living and Learning Environment

FEBE consistently evaluates the learning environment of its students, in order to enhance the delivery of programme offerings. As a result, FEBE sought to evaluate the optimisation of its facilities and equipment, to better serve the needs of students. Following scrutiny and review of all facilities, FEBE chose to return most of its computer laboratories to Central Academic Administration (CAA).

These laboratories are now shared throughout the Faculty as required, administered using the centralised timetable, with the benefit that upgrades of these venues are undertaken at the institutional level.

As part of its annual preparation towards future programme accreditation visits, where possible, the Faculty undertook an audit of its laboratory and computer facilities. Sizeable investments were made into ensuring the safety, maintenance and proper storage of FEBE materials and equipment. In this way, the Faculty has made significant plans towards the improvement and safety of a student's learning environment, in anticipation of their return to campus, for contact learning.

5.4.1 Funding and Investment

Due to funding that was made available for the new BEng Tech programmes, FEBE was able to invest in various new laboratories and laboratory resources, since 2018. These investments have ensured that FEBE consistently works towards the improvement of enhancing the quality and safety of a student's learning environment. The table below lists some of the investments made.

TABLE 2: LABORATORY INVESTMENT

NEW/UPGRADED LABORATORY EQUIPMENT	COST
Mechanical and Industrial Engineering Technology laboratories	
Gas analyser	R82 857
More Ideal Gasses	R98 382
Data Acquisition equipment	R25 547
Special equipment (The Nozzle/Compress Flow range base)	R198 700
Engine Test Set	R236 397
Chemical Engineering Technology laboratories	
DIC System	R596 275
Density testing machines	R137 561
T Silicone Rubber Heating	R13 250
IR Lamps	R20 046
Optical Microscopy software	R76 485
Pycnometer	R299 460
Magnetic Separator	R382 386
Shaking Tables (2)	R626 300
Spinning riffle	R51 750
Membrane purification Rig	R330 000
Water baths, Incubators, analytical balances, and a Lab cool Fridge	R180 000
Bench top Cooling Tower	R310 500
Pump and valves demonstration kits	R70 000
HPLC	R494 000 CAPEX funds to improve research capacity / output for 3rd year BEngTech and Honours research projects
FTIR	R732 000 CAPEX funds to improve research capacity / output for 3rd year BEngTech and Honours research projects

Civil Engineering Technology laboratories	
Foundation laboratory new Consolido-meter setup and equipment	R112 118
Compaction Laboratory new mechanical compactor	R 97 358
Concrete laboratory Creep frames R	R266 296
Heavy Structures lab Moog System upgrade	R342 545
Compaction Lab Hydraulic extruder upgrade	R10 707
Bitumen Lab Marshal extruder upgrade	R11 189
Heavy structures lab bridge tester and supports	R36 125
Electrical Engineering Technology Laboratories	
Digital Desk (60)	R600 000
Logo-Soft PLC Kids	R500 000
Scheider Variable Drives (20)	Donation
Bench Vice (60)	R30 000
House wiring boards (16)	R24 000
Earthing Bench	Donation
Reactive Energy correction Bench	Donation
Renewable Energy Bench	Donation
Capacitor Stands - High power motors (14)	R24 520
Synchronous Machines (3)	R27 000
TESCA Analogue/Digital Trainer	R602 550 CAPEX
TESCA PLC Trainer	R554 600 CAPEX
Workshop tools/machines	R436 000 CAPEX
Steel tables for workshop (16)	R96 000 CAPEX
Opal RT- Realtime digital Simulator	R1 750 000 CAPEX
FESTO Power Electronics Bench Sim	R678 400 CAPEX
Inductor boxes Machines Lab	R65 000 CAPEX
MATLAB Licences (30)	R99 500 CAPEX
Resistor boxes Machines Lab	R115 000 CAPEX

To prevent the duplication of equipment, FEBE has increased the number of shared venues. These laboratories are now shared throughout the Faculty, administered using the centralised timetable with the added benefit that the University (CAA) maintains and upgrades the computers and venues. The following list of venues are now fully shared in the Faculty.

TABLE 3: FEBE - SHARED LABORATORIES

Lab sharing in FEBE	**Departments shared with**
Foundry Lab JOB: G316	Chemical, Metallurgy
Physical metallurgy JOB: 1125	Chemical, Metallurgy
Mechanical laboratory QK: LG201	Chemical, Metallurgy, Industrial, Mechanical
NDT laboratory QK: LG300	Chemical, Metallurgy, Industrial, Mechanical
Chemical Lab JOB: 6218	Chemical, Metallurgy, Industrial, Mechanical
Chemical JOB: G407	Chemical, Metallurgy, Industrial, Mechanical
Studio A computer Lab JOB: 4316	Entire Faculty see details
Studio B computer Lab JOB: 4318	Entire Faculty see details
Studio C computer Lab JOB: 4408	Entire Faculty see details
Studio D computer Lab JOB: 5406	Entire Faculty see details
Computer Lab 400 JOB: 4400	Entire Faculty see details
Computer Lab 500 JOB: 5400	Entire Faculty see details

5.4.2 Changes to Building Regulations

- **Fire and exit doors**

Stringent building regulations in 2018, led to an upgrade of the fire network in the John Orr Building (JOB), based on the Doornfontein campus. This included all laboratories in the building and was completed in 2019. In 2020, the focus has shifted to ensuring that the 28 escape doors of the laboratories meet the required standards. One of the requirements is that doors should be electrically controlled, especially in instances where expensive equipment is found. The doors are to be fitted with alarm systems connected to the central protection services server. This work commenced in 2020 but was halted due to COVID-19 and the associated lockdown restrictions. The process is however again underway, and it is expected that it will be completed between by September 2021. The table below lists the affected venues.

TABLE 4: LABORATORIES WITH ESCAPE DOOR UPGRADES

Building	Room Number	Type of Venue
JOB	G305	Venue
JOB	1306	Venue
JOB	1304	Venue
JOB	5401	Process Lab
JOB	5317	Workshop
JOB	4316	Large type Studio's
JOB	4318	Large type Studio's
JOB	4408	Large type Studio's
JOB	1401	XRF ROOM

JOB	1315	LAB
JOB	1122	LAB
JOB	1121	Laboratory - Sample Preparation
JOB	1125	Laboratory – Physical Metallurgy
JOB	G401	Laboratory - Sand Testing
JOB	G402	Laboratory - Sand Testing
JOB	G316	Laboratory - Foundry Melting and Moulding
JOB	3106	Mining Laboratory (Practical)
JOB	3105	LAB

5.5 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.

FEBE's first advisory meeting for 2020 took place in February 2020, before Level 5 Lockdown restrictions were implemented.

IMAGE 7: FEBE ADVISORY BOARD (FEB 2020)

Despite the pandemic, FEBE maintained its relationships with both local and international communities, schools and industry. Industry engagements took place online, fostering an interactive online approach towards relationship management.

TABLE 5: FEBE LIST OF 2020 STAKEHOLDER ENGAGEMENTS

No.	Title of event	Presenter	Type	Medium	Date
1	ECSA Student Chapter Launch	ECSA and FEBE	Chapter launch	On site	21 February 2020
2	Book Launch - Title: Duality by Design: The Global Race to Build Africa's Infrastructure Publisher: Cambridge University Press.	The Centre for Applied Research and Innovation in the Built Environment (CARINBE). Editors: Nuno Gil, Anne Stafford, Innocent Musonda	Book Launch	On site	11 March 2020
3	2020 Postgraduate Students Induction and Open Day	Postgrad Office: FEBE	Seminar and Induction Day	On site	14 March 2020
4	Expert Talk 1 - INDUSTRY 4.0 AND COVID-19	Yanesh Naidoo; Sales and Design Director Jendamark Automation Pty Ltd. Port Elizabeth	Webinar	Online	26 May 2020
5	Expert Talk 2 - COVID-19 CHALLENGE TO MATERIALS ENGINEERING	Dr. Amogelang Sylvester Bolokang Principal Researcher, Advanced Materials and Engineering CSIR- South Africa	Webinar	Online	27 May 2020
6	Expert Talk 3: INDUSTRIAL ENGINEERING AND COVID-19	Dr. Ahad Ali Associate Professor, Lawrence Technological University Southfi eld, Michigan (USA) Executive Director, IEOM Society International	Webinar	Online	28 May 2020

7	Managing Global Threats: Building Social Value	Prof. Lynn Ilon	Webinar	Online	29 July 2020
8	Towards a Center for Ecological Intelligence	Prof Michael Rudolph	Center launch	Online	30 July 2020
9	The internet of things: An enabling technology for remote condition monitoring of power system equipment	Prof Pitshou Bokoro Moderated by SAIEE	Webinar	Online	19 August 2020
10	Artificial Intelligence in Medical Imaging: Skin Lesion	Prof Serestina Viriri Centre for Collaborative Digital Networks	Webinar	Online	28 August 2020
11	Social Inclusion in Engineering Education	Presenter: Ms. Ness Merckel Facilitated by: Dr Tebogo Mashifana and Prof Kapil Gupta	Webinar	Online	31 August 2020
12	Energy Management for Carbon Emission Reduction in a University Context" and "The Search for the Dark Matter at ATLAS, Statistics for Limiting setting, and GPU Computing to speed this up"	Kenneth Slabbert And Mr Xola Mapekula	Webinar	Online	7 September 2020
13	ECSA Virtual Road to Registration	ECSA	Webinar	Online	10 September 2020
14	Coping strategies: excelling academically during difficult times	Thobani Manci (PsyCAD), Dr Robert Huberts	Webinar	Online	11 September 2020

15	Digital Recruitment and Human Resource Management Challenges during Covid-19	Prof Susanne Wilpers	Webinar	Online	21 September 2020
16	A technology review on IoT sensor networks: A German University's perspective in the light of COVID-19 - Perspectives from a German University	Professor Ansgar Meroth	Webinar	Online	5 October 2020
17	Scalable Smart Cameras for Inline Inspection – Systematic Design of Cloud Based Image Processing - Perspectives from a German University	Prof. Dr.-Ing. Peter Ott	Webinar	Online	19 October 2020
18	Virtual Mining Affinity Group Event	Mr Mike Teke and Vice-Chancellor and Principal Prof Tshilidzi Marwala	Launch	Online	20 October 2020

FEBE's Department of Urban and Regional Planning also undertook to engage with University of Zimbabwe, giving rise to the joint delivery of one of its master's programmes. This model of joint programme delivery that is supported by a collaborative agreement, paves the way for future such collaborations and shared programme delivery and resources and academic rigor.

5.6 Objective 6: Fitness for Global Excellence and Stature (GES)

In 2020, FEBE also engaged the support of an external marketing agency to assist with the development of a Faculty marketing strategy that would ensure the Faculty's new suite of programmes were adequately marketed to the correct target audience. Engaging the expertise of marketing professionals has helped the Faculty elevate the fitness of its response to global competitiveness. These measures will aid the Faculty in extending its reach and impact, effectively marketing new academic programmes that are globally relevant and internationally competitive.

Given the pandemic in 2020, the Faculty geared up its efforts to enthusiastically adopt and utilise social media platforms to market its new suite of programme offerings and online engagements. 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, Faculty awareness and branding.

Anticipating that the pandemic may continue into 2021, as it has done, FEBE used the opportunity to explore innovative methods of facilitating the accreditation process beyond 2020. From gathering programme related evidence from Blackboard to the virtual storage of evidence material, the

Faculty took steps to effectively plan for such initiatives in 2020, with the intention of implementing them in 2021. These initiatives have paved the way for virtual accreditation visits to occur as may be required. In this way, the Faculty has ensured the that the accreditation process will not be delayed any further, by finding appropriate methods to ensure it takes place, confirming the integrity of its programme against national and global standards of excellence.

6. FEBE AND THE FOURTH INDUSTRIAL REVOLUTION

In line with the University's vision to position itself as the University of the 4IR in South Africa, FEBE has conducted various 4IR activities in the realm of Teaching and Learning. A thorough effort was made to integrate appropriate concepts of the 4IR in academic modules offered in the Faculty.

Online webinars and public lectures were also organised by FEBE that included the participation of international experts, speakers addressing FEBE students in particular, and UJ students in general. The 4IR also permeated FEBE pedagogy with the use of innovative teaching and learning technologies, such as virtual reality and artificial intelligence respectively in Mining and Electrical Engineering programmes.

FEBE also delivered a number of Short Learning Programmes (SLPs) related to 4IR via online tools such as Blackboard. In this way, the Faculty has continued its efforts towards the Fourth Industrial Revolution.

Despite the inconvenience associated with the global Covid-19 pandemic and the emergency adjustment in terms of teaching and learning, as well research to virtual formats, The Faculty has continue to

push forward with 4IR, activities in line with the objectives of the Universities. Particularly, some of the highlights in 2020 included:

- Due to the Covid-19 Pandemic, FEBE has had to transition to online Teaching and Learning. Departments made used of various teaching technology with elements of the 4IR technologies such as Blackboard, Zoom, Google drive Suites, etc. for assessments and collaboration with students.

- Various final year projects in Mechanical Engineering Science and Electrical Engineering Science exploited topics of the 4IR in AI, IoT, Big Data, etc. As such, UJ final year students were more than ever exposed and acquainted to 4IR technologies.

- The Faculty hosted numerous public lecturers on the 4IR topics thus increasing its visibility as a University leader in the field. Various teams of researchers were involved with 4IR projects towards providing solutions towards the Covid-19 pandemic (e.g. UJ ventilator project, Additive Manufacturing for the manufacturing of PPE).

- The number of postgraduate 4IR-related topics has grown. FEBE academics have strategically encouraged and supported research in this critical area, to enhance and solidify the role that engineering and the built environment will play and develop as part of UJ's 4IR strategy.

7. FEBE AND DECOLONISATION

- A Joint Master of Sustainable Urban Planning and Development (MSUPD) programme between UJ (Department of Town and Regional Planning) and UZ was approved in 2020. This programme has been designed to address issues of Africanisation (e.g. decolonial and post-colonial theories) and 4IR elements such as Environmental Planning and GIS Applications. This collaborative programme is the result of a VC delegation to Zimbabwe.

- BEng Tech Honours programmes were offered for the first time in 2020. Departments are reporting the inclusion of Decolonisation and 4IR in several new modules. These include modules such as H6MPS8X02 Precise Surveying, IINEEA1 and Advanced Fabrication Metallurgy.

- In addition to this, FEBE has incorporated the UJ African Insights module into each and every undergraduate curriculum. In this way, the module is credit-bearing and forms an integral component of full programme. As this module is offered fully online, FEBE undertook to submit a rule change that would allow students the flexibility to take the module in either Semester 1 or Semester 2. It is intended that this would allow students to complete the module timeously, and not wait a full year to attempt the module again.

8. EMPLOYEE PROFILE

As at 31 Dec 2020, the Faculty employed 182 permanent academic/research staff in comparison to 175 in 2019. Academic staff members comprise of 84 (46 %) designated staff members and 98 (54 %) non-designated staff members. Of FEBE's staff compliment, 41 are female and 3 disabled. The Faculty is cognisant of the importance of recruiting and supporting women in engineering, and strategically seeks ways and means to improve this number, especially in the Faculty Executive.

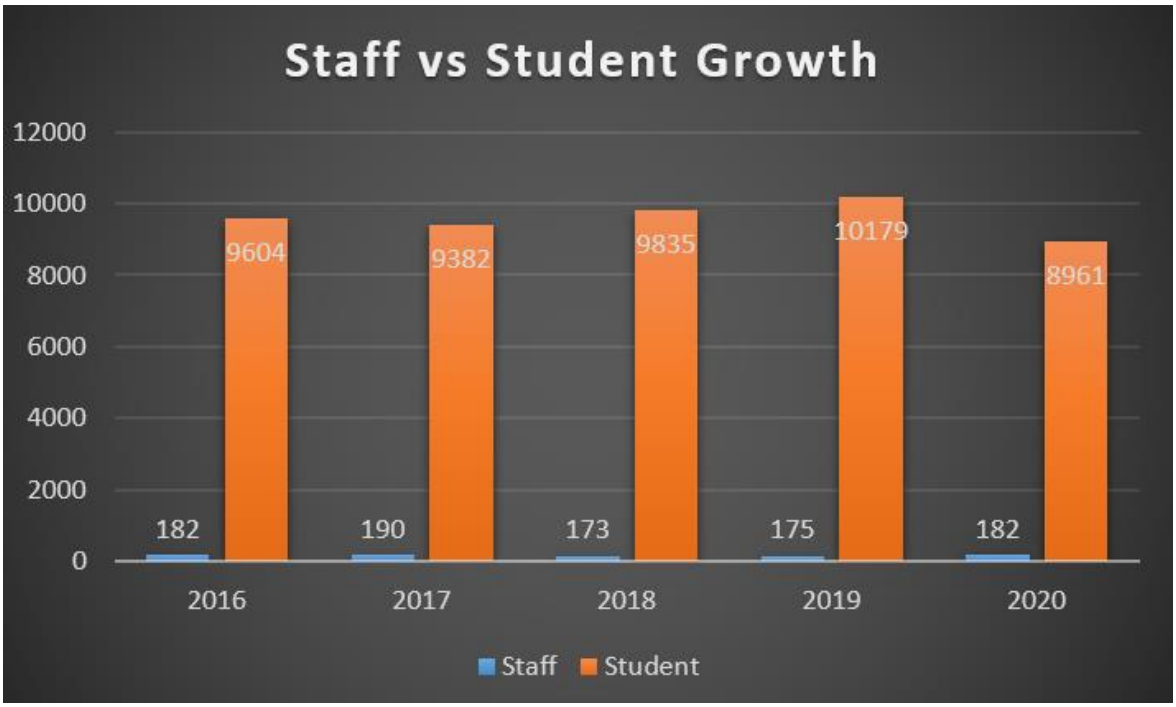


IMAGE 8: STAFF VS STUDENT GROWTH (2016 – 2020)

Whilst student headcount enrolment numbers have momentarily declined, FEBE's pool of qualification offering types has significantly changed. FEBE growth, as part of the Science, Engineering and Technology sector (SET), would warrant targeted staff recruitment, aligned more to the nature of its programme offerings, now being degrees, honours, and other postgraduate qualifications. Staff development therefore, also remains a key focus of the Faculty Executive.

Ernest efforts have been made to fill the critical vacancies resulting from a number of key senior academic resignations. Staff retention therefore remains a critical feature on the Faculty's risk register, which is monitored at the level of the Faculty Executive. However, staff-student ratios have also simultaneously decreased from 1:54 in 2019, to 1:48 in 2020 (Dean's KPI Report, March 2021). This is largely as a result of the rapid phase-out process, which took place at a faster pace than expected.

8.1 Staff Development

In addition, the integral balance of support and academic staff ensures a functioning Faculty that supports, encourages staff development at all levels. FEBE has made concerted efforts towards encouraging staff development. Given the change in programme offerings, staff development is critical towards the sustainability of the Faculty.

Presently, FEBE boasts 100 academics who hold a Doctoral qualification, a significant increase from 90, reported in 2019.

TABLE 6: PERMANENT INSTRUCTION/RESEARCH STAFF WITH A DOCTORAL DEGREE (DEAN'S KPI, MARCH 2021)

Permanent Instruction/Research Staff With a Doctoral Degree	Professor	Associate professor	Senior lecturer	Lecturer	Other	Total
DEANS OFFICE: ENGINEERING	1	3	3		2	9
DEP OF CHEM ENG TECHNOLOGY		4	4	1		9
DEP OF CIVIL ENGINEER SCIENCE	1	3	2			6
DEP OF CIVIL ENGINEER TECH		1	1	1		3
DEP OF CONSTRU MGT & QUANT SUR	2	1	1			4
DEP OF ELEC & ELEC ENG SCIENCE	4	5	5			14
DEP OF ELECTRIC ENG TECHNOLOGY		2	6			8
DEP OF MECH ENG SCIENCE	6	2	7			15
DEP OF MECH&IND ENG TECHNOLOGY		3	6	3		12
DEP OF METALLURGY	2	3	2			7
DEP OF MINING ENG&MINE SURVEY		2				2
DEP OF QUALITY & OPERATION MGT			5			5
DEP OF URBAN & REGIONAL PLAN		2				2
POST GRAD SCHOOL OF ENG MAN	2	1	1			4
Total	**18**	**32**	**43**	**5**	**2**	**100**

TABLE 7: DESIGNATED PERMANENT INSTRUCTION/RESEARCH STAFF

PERMANENT INSTRUCTIN/RESEARCH STAFF			P	AP	SL	L	AL	Other	Total
Designated	African	DEANS OFFICE: ENGINEERING		1		1			2
		DEP OF CHEM ENG TECHNOLOGY			3	2			5
		DEP OF CIVIL ENGINEER SCIENCE				2			2
		DEP OF CIVIL ENGINEER TECH			1	4			5
		DEP OF CONSTRU MGT & QUANT SUR	1		1	5			7
		DEP OF ELEC & ELEC ENG SCIENCE					1		1
		DEP OF ELECTRIC ENG TECHNOLOGY			1	5			6
		DEP OF MECH ENG SCIENCE			1		1		2
		DEP OF MECH&IND ENG TECHNOLOGY		1	2	7			10
		DEP OF METALLURGY	1	2	1	6	2		12
		DEP OF MINING ENG&MINE SURVEY			1	5			6
		DEP OF QUALITY & OPERATION MGT			3	1	2		6
		DEP OF URBAN & REGIONAL PLAN			1	2	1		4
		Total	**2**	**4**	**15**	**40**	**7**		**68**
	Coloured	DEP OF MECH&IND ENG TECHNOLOGY				1			1
		Total				**1**			**1**
	Indian	DEANS OFFICE: ENGINEERING		1					1
		DEP OF CHEM ENG TECHNOLOGY		3		2	1		6
		DEP OF CIVIL ENGINEER SCIENCE				1			1
		DEP OF ELEC & ELEC ENG SCIENCE		1		1			2
		DEP OF ELECTRIC ENG TECHNOLOGY				1			1
		DEP OF MECH ENG SCIENCE	1		1				2
		DEP OF QUALITY & OPERATION MGT			1				1
		POST GRAD SCHOOL OF ENG MAN	1						1
		Total	**2**	**5**	**2**	**5**	**1**		**15**
	Total		**4**	**9**	**17**	**46**	**8**		**84**

TABLE 8: NON-DESIGNATED PERMANENT INSTRUCTION/RESEARCH STAFF (DEAN'S KPI, MARCH 2021)

PERMANENT INSTRUCTIN/RESEARCH STAFF			P	AP	SL	L	AL	Other	Total
Non-Designated	Foreign National	DEANS OFFICE: ENGINEERING		1	1			2	4
		DEP OF CHEM ENG TECHNOLOGY		1					1
		DEP OF CIVIL ENGINEER SCIENCE	1	3	2				6
		DEP OF CIVIL ENGINEER TECH			1	2			3
		DEP OF CONSTRU MGT & QUANT SUR	1	1					2
		DEP OF ELEC & ELEC ENG SCIENCE	3	1	2				6
		DEP OF ELECTRIC ENG TECHNOLOGY		2	4				6
		DEP OF MECH ENG SCIENCE	3	1					4
		DEP OF MECH&IND ENG TECHNOLOGY		2	5	4			11
		DEP OF METALLURGY	1	1	1				3
		DEP OF MINING ENG&MINE SURVEY		1		2			3
		DEP OF QUALITY & OPERATION MGT			2	1			3
		DEP OF URBAN & REGIONAL PLAN		2		2			4
		Total	**9**	**16**	**18**	**11**		**2**	**56**
	White	DEANS OFFICE: ENGINEERING	1		2				3
		DEP OF CHEM ENG TECHNOLOGY			1				1
		DEP OF CIVIL ENGINEER SCIENCE			1	2			3
		DEP OF CIVIL ENGINEER TECH		1	1	1			3
		DEP OF ELEC & ELEC ENG SCIENCE	1	3	4				8
		DEP OF ELECTRIC ENG TECHNOLOGY			2	3			5
		DEP OF MECH ENG SCIENCE	2	1	5				8
		DEP OF MECH&IND ENG TECHNOLOGY			1	1			2
		DEP OF METALLURGY			2				2
		DEP OF MINING ENG&MINE SURVEY		1	1	1			3
		DEP OF URBAN & REGIONAL PLAN				1			1
		POST GRAD SCHOOL OF ENG MAN	1	1	1				3
		Total	**5**	**7**	**21**	**9**			**42**
	Total		**14**	**23**	**39**	**20**		**2**	**98**

8.2 Staff Achievements

Despite the ongoing pandemic, FEBE staff dedication and focus allowed them to still achieve greatly. A sample of staff achievements are listed below.

- FEBE's Executive Dean, Prof Daniel Mashao, was admitted as fellow of the South African Academy of Engineering, the highest professional distinction for an engineer.

- Dr Kingsley Ogudo (Senior Lecturer: Department of Electrical Engineering Technology) was elected as secretary in the SAIEE/Entrepreneurship and Innovation chapter on 14 August 2020.

IMAGE 9: DR KINGSLEY OGUDO

- Prof Hendrik Ferreira received the IEEE Lifetime Achievement Award 2020.

- Prof Kapil Gupta (Associate Professor, Department of Mechanical & Industrial Engineering Technology) received the IEOM Conference Service Award at the 5th NA Industrial Engineering and Operations Management Conference in Detroit on August 14, 2020.

- Dr Richard Ndjiongue Top achievement and high-quality research publications.

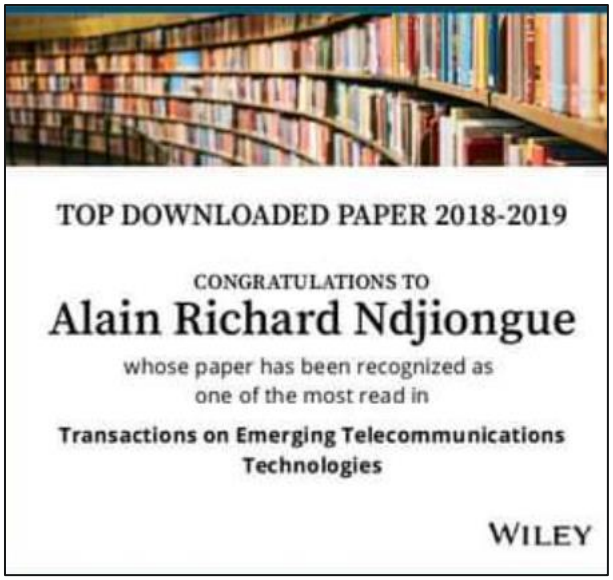


IMAGE 10: DR RICHARD NDJIONGUE - TOP DOWNLOADED PAPER

- Dr Lambrechts led the text: JW Lambrechts & S Sinha, "Millimeter-wave Integrated Technologies in the Era of the Fourth Industrial

Revolution," Lecture Notes in Electrical Engineering, Vol. 679, Springer Nature Switzerland.

- "The Star" newspaper featured the opinion piece by senior lecturer in Chemical Engineering, Dr Tebogo Mashifana and colleague, Lebogang Seale, Senior Manager, UJ Strategic Communications.

- Dr Tebogo Mashifana was also selected as a recipient of the Vice Chancellor's Most Promising Young Teacher Award in 2020.

IMAGE11: DR. TEBOGO PHETLA MASHIFANA

- The Department of Mechanical Engineering Science developed the design for the COVID-19: 3D printed portable ventilator. pt. of Mechanical Engineering Science. This team included:

    - Prof Tien-Chien Jen (Project Lead)
    - Dr Nkosinathi Madushele (3D printing and Coordinator)
    - Mr Rigardt Alfred Maarten Coetzee (Lead Designer and PhD Candidate)
    - Mr Damon James Hoenselaar (Assistant Designer and Masters Candidate)
    - Mr Malcolm Low (Electrical and ECSA Student Chapter President)

IMAGE 12: DR NKOSINATHI MADUSHELE

9. STUDENT PROFILE, SUCCESS AND EXPERIENCE

9.1 Student Profile in Subsidised Academic Programmes

FEBE's 2020 student enrolment profile consisted of 8 939 students in 2020, (HEDA, 26 Feb 2021), a decrease from 10 179 in 2019. This can largely be attributed to the phasing out of diploma programmes, and the introduction of degree and honours programmes. It is intended that the new programmes introduced in 2017 will gain momentum and popularity in the years to come. FEBE has begun actively marketing these programmes, educating potential applicants regarding the change of programme offerings.

TABLE 9: FEBE STUDENT HEADCOUNT OVERVIEW (2016 – 2020)

Year	Student Headcount	FTE Enrolled	FTE Passed	FTE % Pass	Graduates
2020	8,939	4,541.6	3,584.4	78.92%	1,988
2019	10,179	5,463.1	4,329.9	79.26%	2,890
2018	9,835	5,019.8	3,844.4	76.58%	2,799
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

The student population consists of 31 % female students, which has been maintained since 2019. Efforts to attract female learners are actively encouraged and pursued in the Faculty.

TABLE 10: FEBE STUDENT DEMOGRAPHICS

YR	STUDENT	FEMALE	RACE GROUP				AGE GROUP		
	HEADCOUNT	%	AFRICAN	COLOURED	INDIAN	WHITE	< 21	21-24	24 >
2020	8,936	31	8,414	96	184	234	2,239	3,448	3,249
2019	10,179	31	9,598	106	191	284	2,130	4,034	4,015
2018	9,835	30	9,197	108	222	308	1,945	4,181	3,709
2017	9,398	30	8,705	110	227	356	1,860	4,278	3,260
2016	9,604	30	8,870	109	222	403	2,050	4,345	3,209
2015	9,109	30	8,320	104	238	447	2,058	4,180	2,871
2014	8,663	31	7,823	110	233	497	1,963	4,142	2,558
2013	7,595	32	6,749	99	226	521	1,601	3,782	2,212
2012	7,409	32	6,584	108	200	517	2,003	3,591	1,815
2011	7,534	33	6,634	104	196	600	2,288	3,386	1,860
2010	7,148	32	6,160	108	205	675	1,987	3,265	1,896
2009	7,725	31	6,638	105	233	749	2,411	3,357	1,957

A significant portion of the FEBE student population comprises of international students. In 2020, despite the global pandemic, international student enrolments comprised of 1 167 students. The International student profile has grown significantly in recently years, with FEBE eager to continue and encourage this trend.

TABLE 11: INTERNATIONAL STUDENT GROWTH

International Enrolments		2020	2019	2018	2017	2016	2015
Undergraduate	No. of Headcounts	645	789	782	678	675	581
Post Graduate	No. of Headcounts	522	467	440	229	239	208
TOTAL	No. of Headcounts	1167	1256	1222	907	914	789

9.2 Widening Access

With FEBE being the first institution in the country to implement the Bachelor of Engineering Technology programmes, the Faculty undertook to investigate and benchmark programme entrance requirements against other peer institutions, now also offering these professional programmes. As such, entrance requirements were modified to better suit the profile of the student these programmes are meant to attract, to thereby widen access whilst remaining competitively marketable.

The table below illustrate the changes of admission requirements in FEBE, approved in 2020. The changes in Admission requirements were complemented by additional student support essentially in the form of additional tutorship and Integrated Student Success (IIS) interventions.

9.3 Student Success

Feedback from students have indicated that they have adapted well to the online delivery of the 2020 academic year. The Faculty achieved an overall undergraduate success rate of 85.7% during the academic year 2020, an increase of 1.7 percentage point from the previous 2019 academic year.

Overall, the Faculty graduated a total of 1 869 students, a decrease from 2019 in which 2 890 students graduated, (HEDA, 26 Feb 2021). This can largely be attributed to the phasing out of non-aligned programmes, which saw the majority of students completing these programmes in 2019. In addition, new programmes that have recently been implemented, have started to graduate students from 2019. An increase in the number of graduates is anticipated once all new programmes have seen the first cohort complete.

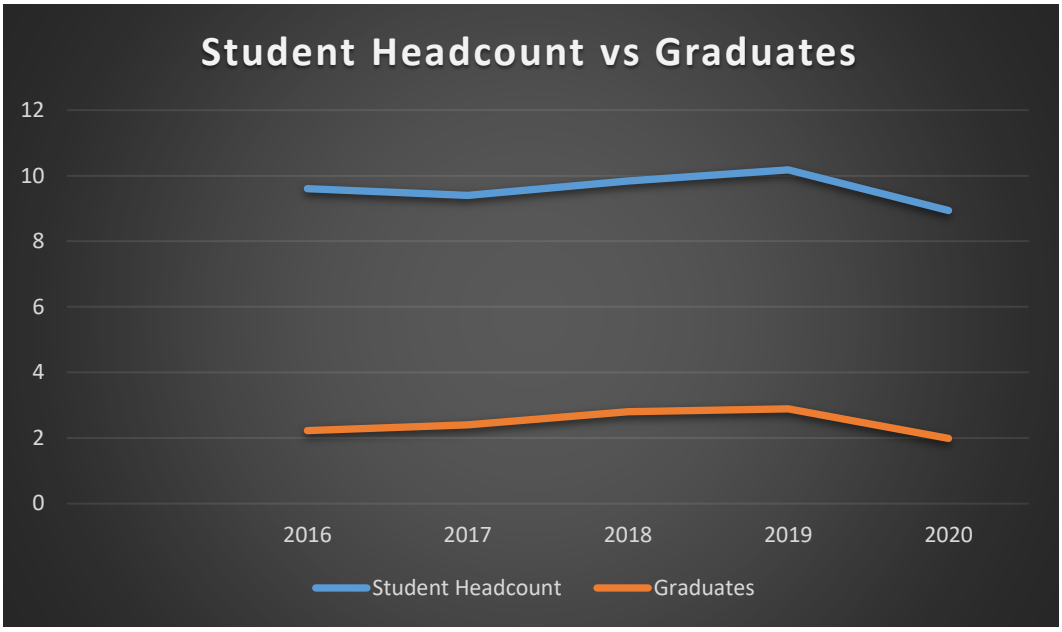


IMAGE 13: STUDENT HEADCOUNT VS GRADUATES (2016 – 2020)

9.4 Student Success – Extended Programmes

The module success rates of the 7 FEBE extended degree programmes were an excellent 88%. The success of this methodology is dependent on strong collaborative relationships with academic staff from FEBE in which the various programmes are located.

TABLE 12: FEBE EXTENDED BACHELOR AND BACHELOR OF ENGINEERING TECHNOLOGY PROGRAMMES

No.	Extended Programme Name	Code
1	BEng Tech (Civil Engineering) Extended	B6CX0Q
2	Bachelor of Construction Extended	B6SCOQ
3	BEng Tech (Electrical Engineering) Extended	B6ELXQ
4	BEng Tech (Industrial Engineering) Extended	B6INXQ
5	BEng Tech (Mechanical Engineering) Extended	B6MEXQ
6	BEng Tech (Physical Metallurgy) Extended	B6PHXQ
7	BEng Tech (Extraction Metallurgy) Extended	B6EXXQ

Despite the global pandemic and with a total of 13% of Access students not participating in the 2020 academic year at all, FEBE Extended students still performed relatively well given circumstances.

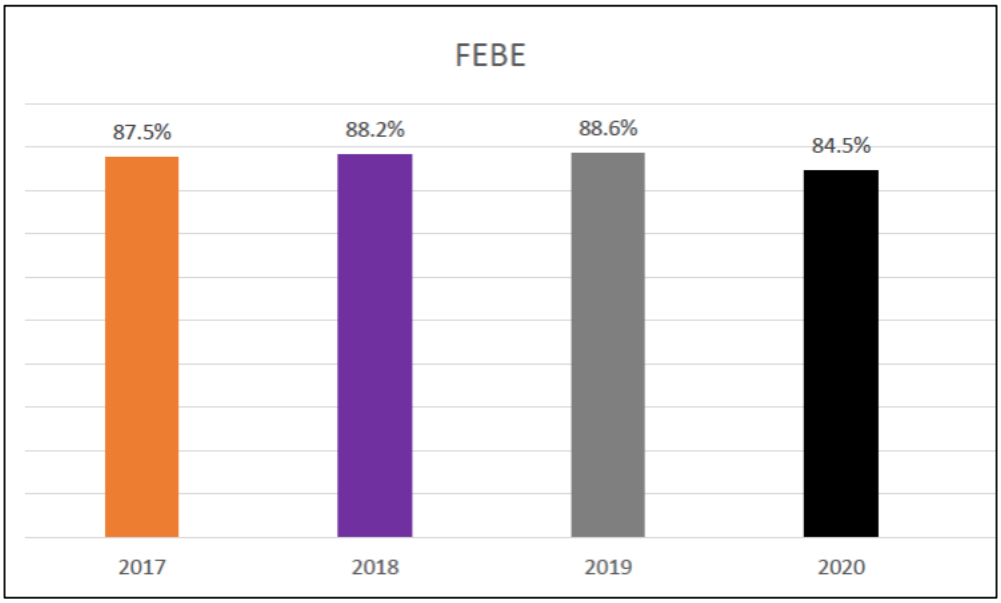


IMAGE 14: SUCCESS RATES OF FIRST-TIME ENTERING (EXTENDED) STUDENTS

FEBE implemented the last stages of the phase-out plan of non-aligned programmes. Given the pandemic, national diploma students lacking only the experiential learning component required for completion, were unable to source employment experience during the various stages of lockdown. The economic downturn also impeded these efforts. As a result, the Faculty has formulated a plan to assist these students towards accessing training that would result in the completion of their studies.

10. Student Experience

Surveys are also useful tools employed by the University, focusing on the student employability and student satisfaction of teaching. Student

satisfaction trends have grown in recent years, as evidenced by surveys conducted. Graduate employability has decreased slightly,

TABLE 13: FEBE GRADUATE EMPLOYABILITY AND STUDENT SATISFACTION IN THE LAST THREE YEARS

Survey	2019	2020
Graduate employability (Percentage of graduates in employment who were employed within 12 months of graduation)	87,9%	86,9%
UG student satisfaction (SA and international)	86.1%	95,3%

11. RELEVANCY AND IMPACT OF ACADEMIC PROGRAMMES

FEBE is now fully aligned to the HEQSF, offering full articulation from undergraduate to postgraduate studies. In 2020, FEBE commenced 12 of its 13 Honours programmes, and another in 2021. Due to delays regarding the timeous approval of these programmes, the new suite of programmes were not sufficiently marketed as intended, however the Faculty did successfully manage to implement all programmes timeously. In addition, most new programmes provide for critical articulation at NQF level 8, which is required for progression into Master's and Doctoral programmes.

The relevancy and impact of the successful accreditation process is substantial, as FEBE has managed to facilitate a challenging transition between non-aligned to fully aligned programmes. During a challenging period of transition nationally, the FEBE suite of new programmes offers seamless articulation pathways all the way up to the doctoral level. This has helped the Faculty maintain stability with regards to its significant contribution towards University enrolment targets in the Science, Engineering and Technology (SET) sector. It has also ensured the steady production of engineering and built environment graduates into the employment sector.

12. RELEVANCY AND IMPACT OF NON-SUBSIDISED ACADEMIC PROGRAMMES

FEBE undertook to offer a number of non-subsidised Short Learning Programmes (SLPs) online, as a result of contact learning not being feasible during the pandemic. In this way, the Faculty was able to ensure the continuity of these programmes, providing much needs skills to students, industry and the public.

Particularly, a number of SLPs developed by UJ's Process, Energy & Environment Technology Station (UJ-PEETS), which is housed in FEBE, centre on critical green solutions and technologies. The impact of these programmes not only enhance and elevate the UJ brand, but provide much needed knowledge and development in this key area.

13. STAKEHOLDER ENGAGEMENT AND REPUTATION MANAGEMENT

Although the Faculty was inhibited by the restrictions associated with dealing the pandemic, FEBE was able to reach out to its communities, stakeholders thereby nurturing crucial relationships. A number of SLP programmes, such as those offered by PEETS, helps FEBE engage with varying communities directly, upskilling community members with green technologies and solutions that will impact their daily lives, and benefit the communities around them.

In 2020, a number of SLPs and events were run online instead of face-to-face contact sessions. In this way, FEBE remained in touch with key stakeholders, both locally and abroad. This format of engagement extended FEBE's reach, and enhanced the convenience communicating and engaging with people, organisations and communities.

FEBE Marketing participated in a number of Career and Science Expos, reaching out to secondary school learners. In this way, information regarding FEBE's new degree offerings was communicated to approximately 77 schools in the greater Gauteng region. Social media platforms were also extensively used to inform and guide Grade 12 learners. In addition to this, the Executive Dean also hosted a Grade 12

Top Achievers webinar aimed at attracting top achieving students to the Faculty.

IMAGE 15: EXECUTIVE DEAN'S GRADE 12 TOP ACHIEVERS WEBINAR

The ECSA Student Chapter was launched in February 2020, enhancing the relationship between Faculty, FEBE students and professional bodies. Given the Faculty's strong affiliation with five professional bodies, this launch paves the way for greater transparency, knowledge dissemination and student engagement regarding professional registration.

IMAGE16: ECSA STUDENT CHAPTER LAUNCH EVENT

Despite the pandemic, FEBE was still able to maintain relationships with a large constituency of stakeholders. Online platforms were extensively made use of, to promote, nurture and build collaborative initiatives both locally and abroad. The pandemic has offered FEBE insight into the use of online technologies that can be leveraged and benefit the Faculty for years to come. Alternate communication methods, virtual engagements and effective online programme delivery has helped the Faculty elevate its reputation.

14. COMMUNITY ENGAGEMENT

Despite the global pandemic, FEBE was still able to find innovative and safe ways to reach out to engage communities.

Below are some of the projects that FEBE academics undertook in 2020.

14.1 TECHNOLAB: Standard bank Robotics Project

The project objective is to introduce robotics to teachers and learners. It is taking place in 10 primary schools in Limpopo and 10 primary schools in North West. The model is to train teachers in robotics, who in turn form robotics clubs in their schools. The learners will eventually participate in the World Robotics Olympiads

14.2 UJ-PEETS: DIY Face Shield Project

The SEED Community, Nectar Farm and The Green Business College have collaborated to fulfil the Ubuntu Project COVID-19 with the mandate to supply food to impoverished dwellers of the Orange Farm community. The project focuses on providing vegetables grown by local farmers in the region and supplying them to those in need. The workers are exposed while performing food parcel distribution. UJ-PEETS saw a necessity to not only provide the team with face shields for protection and assist with curbing the spread of

the corona virus, but also educate the residents to make their own face shields through upcycling waste material.

14.3 MECHANICAL ENGINEERING SCIENCE: Mechanical Ventilation using BVM (Bag Valve Mask)

Additive Manufacturing (3D Printing) was used to develop Mechanical Ventilation Proof of Concept.

IMAGE17: UJ CIVILS CLUB AT BAMBANANI ORPHANAGE

15. RESOURCE MANAGEMENT AND SUSTAINABILITY

FEBE works towards having a close relationship with its finance business partner. To ensure effective and transparent dialogue, the finance business partner is invited to all Faculty executive committee meetings. As a result, the critical focus areas of the Faculty executive are communicated, known to ascertain and explore financial support.

FEBE's operational expenditure budget decreased from 2019. However, as a result of the pandemic, the Faculty spent 49% of this budget. This occurred as a direct result of non-contact learning, with staff and students not physically present on campus since March 2020.

In addition to this, FEBE departments audited laboratories and investigated the financial resources needed to maintain safe and productive learning environments. The Faculty, as a whole, committed to these projects in order to fully prepare for students returning to campus, and the efficient delivery of its programmes.

The Executive Dean and the Head of Departments are the accounting responsible persons in the Faculty. The Faculty also has a Faculty Business Partner who is from the Finance Department of the University working closely with the Faculty to facilitate the budgeting process, consolidate

the Faculty budget and monitor its usage during the academic year. In the Faculty of Engineering, each department has its own budget.

The table below shows the summarised budget of the entire Faculty for the last four academic years. The Personal Remuneration category includes the salary cost to the company of full-time academics and support staff. This budget category also includes all the temporary salaries to ensure, amongst others, part-time lecturing, moderation, thesis examination and invigilation in the Faculty.

The Operating Expenses category represents all expenses directly associated with the running cost of academic departments to offer academic programmes, including the teaching consumables and the repair and maintenance. Capital equipment expenditure essentially encompasses laboratory teaching equipment. The library budget includes the purchase of recommended books for students and subscriptions to databases and journals. Finally, the research budget represents funding received from the Department of Higher Education and Training (DHET) against the research publication two years back from the year in consideration.

TABLE 14: SUMMARISED BUDGETS (FEBE): 2018 – 2021

Category	2018	2019	2020	2021
Staff - Personal Remuneration [R]	178 815 742,20	198 627 149,78	191 559 269,96	204 566 041,52
Operational Expenses [R]	15 886 432,91	14 028 923,85	13 469 832,69	13 170 546,46
Equipment [R]	6 317 000,00	1 953 000,00	4 634 149,50	1 540 000,00
Computing and Network [R] – included in the Ops Budget	812 560,00	282 000,00	103 684,00	610 487,00
Library [R]	9 372 583.00	9,547,687.00	11,987,181.00	10,791,049.20

15.1 Staff Budget

In terms of expenditure, salaries featured as the largest expense. This item represents 90 % of the total expenditure of the Faculty. Full-time permanent or fixed term contracted staff accounted for 88 % of the salaries expenditure whilst temporary staff accounted for 12 %.

There has been a general increase in the staff budget from 178.8 to 204.5 million rands in the last four years. Besides, the inflation-related increase of staff remuneration, the overall increase in the staff budget was mainly due to the increase of full-time academic and support staff in the Faculty from 173 in 2018 to 182 permanent/fixed-term academic

employees in 2020. The promotion of academics over the years has also contributed to the Faculty's overall increase of its salary envelope. The temporary salary, especially related to postgraduate thesis examiner appointments, also contributed to the high personal remuneration in 2021, reflecting the high postgraduate outputs in terms of doctorate and master degrees occurring in the Faculty.

The Engineering Technology Departments on the Doornfontein Campus (DFC) have been the major beneficiary of the overall increase of staff budget in that new academic and technician positions were created in the Faculty to support the introduction of eight new BEng Tech and BEng Tech Honours programmes respectively in 2017 and 2020. New lecturers and technicians were appointed in the Departments of Metallurgy, Chemical Engineering, Electrical Engineering and Civil Engineering Technology. The phasing out of NATED programmes also necessitated new temporary lecturing appointments to absorb the additional lecturing load of existing staff, offering both types of programmes concurrently until the end of the academic year 2019.

The tutorship budget included in the staff budget remained substantial and constant in the last three years. The Faculty views tutorship as an important component of teaching and learning to ensure student success. Ninety per cent of all undergraduate modules are allocated tutors.

15.2 Operational Expenses

The operational budget has remained fairly constant, around an average of 14 million brands over the last four years. Course development, Teaching Consumables and Tours and Excursions categories are its main components which remained unchanged and occasionally increased despite the transition to online teaching in 2020 and 2021 due to the Covid-19 Pandemic. This funding for the operational budget demonstrates the commitment not to compromise teaching and learning in the Faculties and to support all the new programmes introduced including the BEng Tech and BEng Tech Hons programmes.

Student tours and excursions are important teaching and learning strategies of BEng Tech programmes to illustrate the real world of work. Hence the activities continue to be supported by the University. Departments took advantage of easing lockdown restrictions to organise these tours and excursion for students in Mining and Metallurgy's Departments to list a few departments.

15.3 Equipment

Since 2017, the Engineering Technology Departments on the Doornfontein Campus have received additional and special funding from the University Management Executive Committee (MEC) to

support the implementation of the eight new BEng Tech programmes and prepare for the regular ECSA accreditation of these programmes initially scheduled for 2020. In 2020, an amount of R 4 000 000.00 was committed by the University for the DFC programmes. This funding has mainly been used to:

- Acquire new laboratory equipment (e.g. Department of Chemical Engineering, Metallurgy and Electrical Engineering)
- Maintain old laboratory equipment and upgrade of laboratories (e.g. XRF, XRD apparatus in the Department of Metallurgy, Bitumen laboratory in the Department of Civil Engineering Technology)
- The upgrade computer venue (Department of Civil Engineering Technology: Venue G110).
- To comply with the health and safety regulation for the laboratories on the DFC campus. Following a survey of the compliance of laboratories in 2019, upgrade work was undertaken in 2020 to upgrade the laboratories in terms of signage, exit doors, safety doors and removal of gas bottles outside laboratories to be placed on balconies. Some of the upgrade work was disrupted by the Covid-19 pandemic but is ongoing in 2021.

15.4 Computing and Network

Long before the Covid-19 pandemic, FEBE had committed to using ICT technology for teaching and learning. This strategy was implemented by the requirement to have programme modules uploaded on the Blackboard Learning Management System (LMS) and the use of e-books by students. This approach had to be supported by reliable computing and networking devices and infrastructure. The increase of this budget is the Faculty's continued commitment to using ICT technology and a leading academic institution to the Fourth Industrial Revolution.

15.5 Travel and Research

Every year, UJ publications are submitted to DHET and evaluated in order to establish the subsidy that must be paid to the University. When UJ receives publication subsidy from the DHET, 50% of the subsidy is retained by the University and the remaining 50% is disbursed to the Faculty. Part of the publication funds received by the Faculty are disbursed to the researcher to further his/her research activities and the remaining half is retained by the Faculty to help fund Faculty research strategic initiatives. FEBE encourages and supports postdoctoral research.

The Faculty also engages in collaborative projects through a number of National and International partners, such as National Research Foundation (NRF).

16. LEADERSHIP

FEBE leadership was elevated and tested during the 2020 academic year. As the Faculty traversed uncharted territory associate with the repercussions of the pandemic, the Executive Dean of the Faculty, Professor Daniel Mashao, Vice-Dean: Teaching and Learning, Professor Didier Nyembwe and Acting Vice-Dean of Postgraduate Studies, Research and Innovation, Prof Yanxia Sun, ensured stability, progress and encouragement.

In addition to crucial academic guidance and support, FEBE leadership was able to offer support where needed, as it related to the personal, mental and physical hardships being experienced by both staff and students during the pandemic.

The challenging circumstances of 2020 called for nuanced leadership, with an adaptable and flexible approach towards problem-solving and relationship management. With FEBE staff and students having successfully completed the 2020 academic year, with noticeable student success, is a testament to the way in which FEBE leadership, on all fronts, was able to direct the Faculty towards a successful completion of the academic year.

17. CONCLUSION AND WAY FORWARD

FEBE's strategic transformation is nearly complete, as staff and academics gear up for the improved implementation of fully articulated undergraduate programmes and a niche suite of postgraduate offerings. With this new trajectory, the Faculty remains committed towards the growth and fit-for-purpose contributions towards the Science, Engineering and Technology (SET) sector.

FEBE has therefore taken active measures to re-brand and re-purpose itself as a key contributor towards the growth of SET programmes. In addition, FEBE has remained committed to recognising and welcoming the critical role that industry and professional bodies will holistically play towards achieving the intended growth, impact and sustainability of its programmes.

As FEBE ventures forward, it does so armed with a wide variety of robust and competitive engineering and built environment programmes. Cutting-edge programmes such as the Master of Sustainable Energy and the Master of Micro and Nano-electronics are helping FEBE lead the way, towards an unchartered but innovative and promising future.