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POSTGRADUATE ADMISSION REQUIREMENTS FOR THE COLLEGE OF SCIENCE ENGINEERING AND TECHNOLOGY (CSET)
PART A: DISCIPLINE-SPECIFIC ADMISSION REQUIREMENTS

1. PREAMBLE

There is a countrywide awareness in the South African scientific community that much will have to be done to ensure that sufficient South African citizens qualify with higher degrees in order to meet the country's future demands.

In their groundbreaking evidence-based report on PhD studies in South Africa, the Academy of Sciences of South Africa highlights a number of primary barriers that hinder increased throughput of PhD students. Some of these barriers are actually within the control of tertiary institutions. These include "the quality of incoming students and blockages in the graduate and postgraduate pipeline", and "limited supervisory capacity". In addition, the report finds that a significant percentage of students (50%) select a programme (and therefore the associated institution) on the basis of a specific research focus.

There is a strong momentum currently in the university to examine policy, procedures and processes associated with higher degrees in order to ensure optimal throughput of students electing to do their master's or doctoral degrees with the university. The adoption of the new Master's and Doctoral Policy and Processes and accompanying narrative documents during the March 2013 session of the Unisa Senate marks a significant milestone in this regard.

Although the ongoing overall process reviews are holistic and encompass all aspects of Unisa's offerings to postgraduate students, the current document contains information required by the approved Narrative document for Unisa master's and doctoral processes on three aspects that links closely to the findings of the ASSAf report. These are:

- Entrance requirements for students in the College of Science Engineering and Technology (in order to ensure that the quality of incoming students are such that they have an optimal change of completing their qualifications);
- Showing specific research focus areas in the college where there is supervisory capacity, which facilitates the choice for students in term of the focus of specific programmes and projects and ensures that available supervisory capacity is not exceeded.

2. HISTORICAL TRENDS

2.1 CSET postgraduate enrolment trends

Overall enrolment patterns in CSET have shown exponential growth especially in the past three years. These growth patterns are as follows:

Table 1: Numbers of students registered for masters and doctoral degrees in CSET: 2005 - 2015

Year	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
No. M registrations	88	86	81	76	93	128	169	293	343	322	325
No D registrations	32	34	33	39	65	89	126	199	226	235	268
Total	120	120	114	115	158	217	295	492	569	557	593

registrations											

For higher degree registrations the percentage growth for the College was as follows:

Table 2: Percentage growth in registrations for higher degrees in CSET: 2006 - 2015

Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
MSc growth	-2	-6	-6	22	38	32	73	17	-6	1
PhD growth	6	-3	18	67	37	42	58	14	4	14
CSET overall	**0**	**-5**	**1**	**37**	**37**	**36**	**67**	**16**	**-2**	**6**

Historical trends for CSET show an strong overall increase in growth since 2009, which has exceeded strategic targets, and which has led to certain research areas in CSET (notably many areas within the School of Computing) reaching supervisory capacity. The implementation of the new Unisa M&D policy and procedures have brought growth to more manageable numbers.

2.2 CSET graduation trends

Graduation trends over the past three years are as follows:

Table 3: Graduation trends in CSET 2011 - 2014

Year	2011	2012	2013	**2014**
M graduations	11	9	7	28
M growth (%)		-18	-22	400
D graduations	2	2	10	15
D growth (%)		0	400	50
Overall graduations	13	11	17	43
Overall growth (%)		-15	55	253

These graduation rates, although encouraging in terms of overall growth are from a very low base, and compared to high numbers of registrations highlight the concern that more needs to be done in order to ensure that the entire postgraduate process from admission to graduation is optimized to ensure maximal postgraduate throughput.

3. PROJECTIONS (UNTIL 2017)

Projections of estimated growth until 2017 are shown below. Factors impacting on growth are the following:

(1) School of Computing (SOC) has reached capacity and the backlog of students still needing to be assigned supervisors mean that further growth in numbers will be limited to enrolment in specialized niche areas in SOC;

(2) M&D programmes for School of Engineering (SOE) are not envisaged to commence in the near future and growth trends are expected to be in line with trends over the past three years;

(3) The new laboratories available on the Science campus will be attractive for prospective students in School of Science (SOS), and combined with the need for postgraduate students to support the research

activities of the three research chairs in SOS some growth in postgraduate students in science is expected to be maintained. However, given the specialized nature of these areas in science growth is expected to be limited. Growth in CSET in general needs to be strongly encouraged to support Unisa's vision of the Florida campus becoming a regional science hub.
(4) The establishment of the two new research units in CSET: Material and Process Synthesis and Nanotechnology for Water Sustainability.

Table 4: Projected registrations for higher degrees in CSET (up to 2017)

Year	2015	2016	2017
Projected M registrations	328	344	361
Projected M growth (%)	7.5	5	5
Projected D registrations	270	284	298
Projected D growth (%)	6.5	5	5
Projected overall registrations	598	628	659
Projected overall growth (%)	0	2	5

4. CURRENT STATUS

There is a real need in CSET to take strong measures to improve the throughput of master's and doctoral students, as the number of students graduating (although growing strongly from a low based) still compares poorly to the overall number of registrations. The admissions criteria set out in this document forms part of these measures, but ultimately the entire chain of events from application to graduation will be revised, which is in line with the activities undertaken on a university-wide scale by Unisa under the leadership of the College for Graduate Studies (CGS).

Currently the status regarding higher degrees studies in CSET is as follows. The exponential growth of students registering for masters and doctoral degrees in Computing has resulted in the School of Computing reaching its supervisory capacity. Only limited spaces in niche areas remain, and given current Unisa initiatives to advertise these niche areas, a small growth in postgraduate student numbers in SOC may be expected. Given the specialized nature of ICT at postgraduate level, the limit has also largely been reached in terms of engaging external supervisory capacity. Most potential postgraduate supervisors are already affiliated with other academic institutions and are performing supervisory duties elsewhere. It remains essential for the SOC that a new admissions processes under the new M&D policy approved by senate allows for batch processing of applications, the assignment of a supervisor for each student prior to admission, and selection methods between applications in instances where high numbers of potential applicants wish to enroll for a particular research focus area within Computing
For all other departments in CSET it is important to stimulate continuous growth as part of growing Unisa's status as a centre of excellence in science at the Science campus. The impetus provided by the appointment of research chairs in nanotechnology, ecotoxicology, topology and high speed computing needs to be sustained by providing means that all potential students (given the scarcity of such students) that are interested in working in these areas can be registered with immediate effect in order to prevent them from deciding to register elsewhere at other facilities. For all other departments it is therefore important that registration of students will continue to take place on a continual basis throughout the year, as previously approved by Senate.

5. PURPOSE AND AIMS OF THIS DOCUMENT

At the 13 March 2013 meeting Senate resolved regarding the Unisa Policy on Master's and Doctoral Degrees as follows:

> "*(1) That the Policy on Master's and Doctoral Degrees be recommended to Council for approval; (2) That the selection criteria in the document "Processes for Master's and Doctoral Research Degrees" be approved; (3) That for the purposes of approval, the dates indicated in the document "Processes for Master's and Doctoral Research Degrees (2014)" be deleted; (4) That the accompanying narrative document be approved*."

This document sets out the requirements of the approved narrative document that requires three types of information to be provided by each College, School, Department and Institute, viz. *(1) the research opportunities and available supervision capacity; (2) the selection criteria in the form of requirements to be satisfied and information to be provided by the prospective candidate on the basis of which the admission application will be assessed, and (3) propose possible differentiated registration dates, college specific due dates and admission and registration information to suit the needs of the various colleges, schools and departments in accepting M&D candidates taking into account the proposed dates on the diagram and subsidy cut off dates.*

This document is applicable to the College of Science Engineering and Technology, its schools (School of Computing, School of Engineering and School of Science) and its departments.
For each of the types of information required the document firstly sets out information that is applicable to all schools and departments in CSET, and then provides specific additional information that applies uniquely either to schools or to departments within schools.

The admissions requirements contained in this document have been widely disseminated and discussed within the College and have served at various College structures, including the College Board, the College Higher Degrees Committee, the College Executive Committee and the College Research and Innovation Committee. The College Executive Committee approved the requests below for submission to Senate Higher Degrees Research and Innovation Committee and Senate. The admissions requirements in this document do not differ from the admissions requirements previously approved by Senate. The only updates contained in this document relates to specific projects that postgraduate students can potentially participate in as well as research foci and supervisory capacity of supervisors in CSET for 2016.

In order to therefore fulfill the requirements in the narrative document adopted by Senate, the College of Science Engineering and Technology requests approval of this updated document that contains opportunities, selection criteria and related information, and admission and registration information for admission to postgraduate qualifications (Master's and Doctoral degrees) as stipulated below.

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6. TYPE 1 INFORMATION (OFFERINGS TO POTENTIAL POSTGRADUATE STUDENTS)

This document sets out the projected supervisory capacity for 2016 for higher degrees (MSc, MTech and PhD) of the various departments and schools in the College of Science, Engineering and Technology. The supervisory capacity is indicated per school for the School of Computing, the School of Engineering (Departments of Electrical and Mining Engineering, and Civil and Chemical Engineering) and the School of Science (Departments of Physics, Chemistry, Mathematics and Statistics).

6.1 Projected 2016 supervisory capacity: School of Computing

6.1.1 2016 Research Projects that students can participate in

Please note that the following projects that students can participate in are actually led by researchers from the Department of Electrical and Mining Engineering. However, students who wish to register for MSc or PhD studies on these projects will be registering for an MSc in Computing or a PhD in Computer Science. Students registering for an MTech who participate in these projects will do so in Electrical Engineering.

Project Leader	Name of project	Brief Description of the project	Master's or doctoral capacity available	No. of available positions for 2016
Prof. Z Wang	Intelligent System Research Group	1. Control Theory and Control Engineering: Adaptive Control, Predictive Control, Process Control, Advanced PID Control, Optimal Control, Fuzzy and/or Neural Network Control, Fault Diagnosis and Fault Tolerant Control and Electrical Machine Control, among others. 2. Artificial Intelligence: Neural Network and Fuzzy Logical, Brain-computer Interface or brain-machine interface based Artificial Intelligence application 3. Evolutionary Optimisation and its applications: Particle Swarm Optimisation, Genetic Algorithm, Energy Optimisation, Evolutionary Multi-Objective Optimisation 5. Measurement instrumentation: Ultrasonic Measurement, Filter Algorithms (signal processing), Internet Closed-Circuit television (CCTV) design and development.	Master's or doctoral	3

6.1.1 Research focus areas of individual study leaders

Internal Supervisors	Research area	Master's supervision slots open	PhD supervision slots open
Prof Isaac Osunmakinde	Machine Learning and Computational Intelligence - Robotics and Agent systems, Environmental Safety, Sensor and Telecommunication Networks, Business Intelligence, & Computational Sciences	3	4
Prof Jan H Kroeze	IS Research Theory and Philosophy, Formal Ontologies, Data warehousing and business intelligence, IT management	0	0
Prof Ian Sanders	Algorithms; Computational Geometry; Image Processing; Computer Science Education	1	1
Prof Judy van Biljon	Usability and user experience, design and evaluation of e-learning and m-learning applications, mobile technology for teaching and learning in developing countries	0	0
Prof Felix Bankole	Expert Systems, Decision Support Systems, Multi-Criteria Decision Analysis, Database Systems, IT & Productivity, Telecommunication Systems	4	4
Prof Alfred Coleman	ICT in health (e-health) and Business Informatics & Knowledge Management	2	1
Prof Elmarie Kritzinger	Information Security Education	0	0
Prof Marianne Loock	Information Security Awareness; Information Security and Business Intelligence; Access Control in a Data Mining environment	0	1
Prof Peter Mkhize	Knowledge management, Strategic Information System	2	1
Prof Ernest Mnkandla	Applying agile methodologies to improve software quality. 1. Software Engineering: software process improvement (SPI), PSP/TSP, Software development methodologies, frameworks, models etc. agile software development methodologies, the adoption issues in agile software development methods, software defects management, and software quality assurance. 2. Software project management: tools and techniques for improving product quality, the relations	0	0

	between PMIs PMBOK and Agile Project Management.		
Prof Hossana Twinomurinzi	E-government, ICT for development (ICT4D), e-entrepreneurship (ICT in Entrepreneurship), mobile app development (from a sociotechnical dimension)	2	2
Prof Mc Donald van der Merwe	e-Learning, m-Learning, Psycho-physiological aspects of Human Computer Interaction, Open Source movement	2	0
Prof Etienne van der Poel	Computational Creativity, Machine Learning. Artificial Intelligence	2	2
Ms Hanifa Abdullah	Governance, Risk Management, Information Security and Compliance	1	0
Mr Danie Bisschoff	Designing Banking Technology for the Aged and Disabled	4	0
Dr Adele Da Veiga	Information security culture - Human behaviour and information security - Privacy, Protection of Personal Information Act (PoPI) - Governance and management of information security - COBIT, ISO27001/2, security standards and frameworks - Cyber security culture - Process mapping and data flows - Information security project management - Information security audit and control - Information security awareness and training - Information security policies - Risk management	2	2
Mr Ken Halland	Applied Logic and Description Logics	3	0
Dr Grant Howard	Organisational Change and IS/IT; Green Information Systems (Green IS); Green Information Technology (Green IT); Green Computing; ICT for Sustainability (ICT4S).	3	3
Dr Jan Mentz	Enterprise Architecture, Enterprise Modelling, Enterprise Architecture Frameworks, reference architectures, cloud computing, Enterprise Governance and information systems in business.	0	0
Mr Mathias Mujinga	Information Security, Usable Security, Cloud Computing Security	0	0
Mr Elisha Ochola	Routing Protocols in Mobile Wireless Ad Hoc Networks, Ad Hoc Networks Security	0	0
Mrs Marthie Schoeman	Computing education, visualization, ODL	0	0

Dr Shawren Singh	e-Government	2	0
Mr Sam Ssemugabi	Human-Computer Interaction, e-Learning, e-Skills, e-Service quality, Application of mobile technology	2	0
Dr Bobby Tait	Network Security, Voice Recognition, Biometrics, Applied Encryption Technologies; Forensics	0	0
Dr W van Staden	Information Security, Privacy, Anonymity, Digital Forensics	2	0
Mrs Bester Chimbo	Human-Computer Interaction; Designing for children with children and other special user groups; Design of Technology for Education.	1	0
Mr Baldreck Chipangura	Mobile Centric Access to Information	1	0
Mr Cyrille Dongmo	Combining semi-formal and formal specification techniques - Requirements Engineering - Goal-Oriented Requirements Engineering (GORE) Methods - Formal Software Requirement Specification with Z/Object-Z - User Requirements Notation (URN).	1	0
Dr Vincent Horner	Areas: e-health. Epidemiology research. Primary health care. Public health medicine. Quality assurance and clinical practice guidelines. Community outreach primary health care. M-health. ICT4Health. Preference: I would like to work with students that are interested in projects that have an in-depth engagement with the health system, rather than a superficial one.	2	1
Mrs Petra le Roux	ODL e-Learning and e-Assessment; Computer Science education : Programming; Psychological Aspects of Computing and Information Systems	1	0
Mr Colin Pilkington	Computing education, Virtual learning environments	1	0
Mrs Dorothy Scholtz	e-Learning, Project Management, Information Systems, ODL	0	0
Ms Anitta Thomas	Trust Negotiation in Information Security	0	0

External Supervisors (from other departments in Unisa)	Research Area	Master's supervision slots open	PhD supervision slots open
Prof Mariki Eloff	Computer and Information Security,	0	0

	Project Management		
Prof Les Labuschagne	IT Project, Programme and Portfolio Management:	0	0
Prof Hugo Lotriet	Epistemic issues in IS, Socio-technical systems, ICT4D	0	0
Prof Richard Naidoo	Scientific computing, technology enhanced learning and simulations; viz modelling in Communications systems;	1	1
Prof Laurette Pretorius	Natural language processing and computational linguistics; Natural language technology for under-resourced languages; The role of natural language and multilingual natural language processing in semantic computing, semantic technologies, including ontology development; knowledge extraction from text; controlled natural language for domain specific precise machine translation and language generation.	1	1
Prof Andre (John) van der Poll	Formal Specification Techniques, Automated Reasoning, Combining Formal and Semi-formal Specification Techniques, Formal Methods in Business Applications; Formalisms in Cloud Computing (CC); Formalisms in Business Intelligence (BI)	3	3

6.1.2 Modes of supervision in the School of Computing

The current mode of supervision in the School of Computing entails one-on-one supervision. Where desirable a co-supervisor may also be appointed.

6.1.3 Opportunities for external supervision

See the table in section 6.1.1.

6.1.4 Contact details for the School of Computing

Entity	Name	Designation	Telephone	e-mail

6.1 Projected 2016 supervisory capacity: School of Engineering

Please note that the School of Engineering currently offers only MTech qualifications.

6.2.1 Department of Civil and Chemical Engineering

6.2.1.1 2016 Research Projects that students can participate in

Project Leader	Name of project	Brief project description	No of available positions for MTech/MSc/PhD students in 2016
Prof L L Jewell	Flagship project catalysis and energy (applied for)in Nanotechnology and Fuel Cells	Synthesize, characterize, and optimize the local production of membrane electrode assembly for fuel cells. Synthesize and characterize new heterogeneous catalysts and/or apply them in novel energy conversion processes, including biomass/bio oil conversion, photocatalysis for hydrogen production from sustainable sources, for example, bioalcohols.	4

6.2.1.2 Research focus areas of individual study leaders

Name of supervisor	Brief Description of research focus areas	No of positions for MTech/MSc/PhD students available for 2016
Prof LL Jewell	Fischer Tropsch Catalysis Environmental Catalysis	2
Prof B Patel	Process synthesis and modelling Biomass conversion to fuels and products	3

Dr. T Mokrani	Nano composite membranes for fuel cell Novel polymeric membranes for fuel cell Membranes for gas separation Membranes for water treatment Heterogeneous catalysis Electrocatalyst Natural gas conversion	4
Dr. CM Masuku	Fischer–Tropsch Synthesis, Chemical Engineering Thermodynamic Modelling, Clean-Fuels and Renewable Energy Research, Application of Computational Intelligence Techniques to Chemical Engineering.	3
Prof Scurrell	Heterogeneous catalysis Natural gas conversion Advanced methods in catalyst synthesis (microwave radiation, cold plasma) and characterization Sustainable hydrogen from biomass/biofeeds	2

6.2.1.3 Modes of supervision in the Department of Civil and Chemical Engineering

The current mode of supervision in the Department of Civil and Chemical Engineering entails one-on-one supervision. Where desirable a co-supervisor may also be appointed.

6.2.1.4 Opportunities for external supervision

Currently no new opportunities for external supervision for 2016 are available.

6.2.1.5 Contact details for the Department of Civil and Chemical Engineering

Entity	Name	Email	Telephone
Department of Civil and Chemical Engineering	Prof L. Jewell (COD)	JewellL@unisa.ac.za	011 471 2761

Department of Civil and Chemical Engineering	Dr C.M. Masuku	masukcm@unisa.ac.za	011 471 2343
Department of Civil and Chemical Engineering	Prof F. Ilunga	IlungM@unisa.ac.za	011 471 2791

6.2.2 Department of Electrical and Mining Engineering

6.2.2.1 2016 Research Projects that students can participate in

Please note that the two projects listed under School of Computing for Intelligent Systems, as well as Image Control and Processing are actually projects led by researchers from the Department of Electrical and Mining Engineering. Students wishing to register for MSc qualifications in Intelligent Systems or Image Control and Processing will however register for an MSc in Computing. Students who register for MTech qualifications on these two projects can do so in Electrical Engineering. In addition, the following project is available for students wishing to register for an MTech in Electrical Engineering.

Project Leader	**Name of project**	**Brief Description of the project**	**No of available positions for Master's students for 2016 (MSc or MTech)**
Prof. Z Wang	Intelligent System Research Group	1) An ultrasonic logging sample instrument development; 2) Ultrasonic testing 3) Brain-computer Interface or brain-machine interface based Artificial Intelligence application 4) Model predictive control (Advanced PID Control, Optimal Control, Fuzzy and/or Neural Network Control, or Fault Diagnosis and Fault Tolerant Control) of electronic motors/ Humanoid Robots;	3

		Note: there are equipment and devices to do experiments in the lab of the UNISA science campus and the experiments are necessary for the above 4 projects. 5) Evolutionary optimization Based Economic Dispatch (Reactive Power Control or Power System Controller Design) of Power System 6) Artificial intelligence and their application in image processing. 7) Internet Closed-Circuit television (*CCTV*) design and development. 8) Design and Development of distance experiment system 9) Particle swarm optimization based PID (or T-S Fuzzy, QFT, model predictive) controller tuning 10) Image/speech recognition based on neural network 11) Telecommunication network optimization	
Prof LW Snyman	Alternative Energy CMOS Optoelectronics	Alternative Energy CMOS Optoelectronics (M&D students and the doctoral students will register in School of Science.)	**4**
Prof. G Qi	Mechatronic control and Chaos	Mechatronic Control: Model-free control mobile robot movement, wheelchair movement control, active magnetic bearing control, cub-satellite attitude control, antenna azimuth position control using lab view, inverted pendulum control using Quanzer base station and Labview, DC motor control through Labview, Humanoid Robot, Development of Six Wheel-Legged Mining Robot. Chaos Generation and application in secure communication: Chaos generation; Chaos implementation using FPGA and circuit; Chaos analysis, Chaos-based secure communication and systems design; Chaos-based image encryption in	**4**

		secure communication system; Chaos analysis and implementation via FPGA; A two-level chaos based cryptography for image security; Internet encryption through hyperchaos; Chaos control and synchronization. Chaotic encryption to secure effective spectrum usage in cognitive radio; Video encryption based on Qi hyper-chaos	

6.2.2.2 Research focus areas of individual study leaders

Name of supervisor	Brief Description of research focus areas	No of positions for MTech students available for 2016
Prof LW Snyman	Alternative Energy CMOS Optoelectronics (M&D students)	4
Prof Z Wang	See the description of research projects listed under section 2.1 for the School of Computing	See Section 2.1
Prof Qi	Nonlinear Adaptive Control, State Estimation and Prediction for Mechatronic Systems and General nonlinear systems, Robotic Movement Control, Chaos-based Secure Telecommunication, Chaos-based cryptography, Optimisation in the Methodology of Artificial Intelligence (Neural Networks,etc.)	4
Prof. F Mulenga	1. Mineral processing: Comminution (Milling and Crushing), particle size analysis (Sieving, Industrial screening, and Classification), flotation, mineral beneficiation (Gravity concentration, and Dense Medium Separation DMS) 2. Modeling and simulation of minerals engineering processes: Metallurgical Accounting, Process Control in Minerals Processing plants (Concentrators), Mineral	2

	liberation and Image processing for polished sections, Discrete Element Modeling (DEM) and Computational Fluid Dynamics (CFD), Flow sheet design, simulation and optimization with MODSIM (as preferred software package), Attainable Region (AR) analysis 3. Open pit mining: Rock Mechanics, Open pit mine planning, Mine Sequencing	
Mr. P Umenne	Telecommunications, Micro-Electronics, Network modelling, simulation, network protocols, OPNET. Femtosecond laser fabrication	1
Mr L Nickola	Plane automation	2
Mr WP Nel	· Engineering Management · Management of Technology · The adoption and diffusion of innovation	1

6.2.2.3 Modes of supervision in the Department of Electrical and Mining Engineering

The current mode of supervision in the Department of Electrical and Mining Engineering entails one-on-one supervision. Where desirable a co-supervisor may also be appointed.

6.2.2.4 Opportunities for external supervision

Currently no new opportunities for external supervision for 2016 are available.

6.2.2.5 Contact details for the Department of Electrical and Mining Engineering

Entity	Name	Email	Telephone
Department of Electrical Engineering	Prof Z Wang (M&D Co-ordinator)	wangz@unisa.ac.za	011 471 3513

6.2.3 Projected 2016 supervisory capacity: Material and Process Synthesis Research Unit (MaPS)

Please note that the School of Engineering currently offers only MTech qualifications. Students wishing to register for an MSc or PhD will register in either the Departments of Chemistry or Physics in the School of Science.

The MaPS team generally works as a team who supervise the research students. The students are grouped into the research areas which are listed below.

6.2.3.1 2016 Research Projects that students can participate in

Project Leader	Name of project	Brief project description	No of available positions for MTech/ MSc/ PhD students in 2016
Prof D Hildebrandt and Prof D Glasser	Material and Process Synthesis	The research looks at improving the efficiency of chemical process. Specific research interests include biological processes, minerals processing and individual unit operations, such as separation and reaction. Processes that convert chemicals for energy production are of particular interest	20

6.2.3.2 Research focus areas of individual study leaders

Name of supervisor	Brief Description of research focus areas	No of positions for MTech/ MSc/ PhD students available for 2016
Prof D. Hildebrandt Prof D. Glasser Dr. J. Fox Dr. C. Sempuga	Process Synthesis: Thermodynamic analysis of processes for chemical conversion and / or energy production. Particular projects include: • Improvement of current methods and development of new methods for real plant synthesis and design. • Adapting process synthesis methods to biological systems	3
Prof D. Hildebrandt Prof D. Glasser Dr. X Liu Dr. X. Lu Dr. Y. Yao	Fischer Tropsch: design of processes and reactors that convert syngas to chemicals. Particular projects include: • Catalyst studies • Heat transfer studies • Improving the reactor design	3
Prof D. Hildebrandt	Gasification: Development of simple methods for modeling	3

Prof D. Glasser Dr. J. Fox Dr. C. Sempuga Dr. L. Ngubevane	of gasification • Investigate the use of MSW and biomass as feed stocks for gasification • Modelling of gasification systems	
Prof D. Hildebrandt Prof D. Glasser Dt. T. Matambo	Bio Technology: cleaning up of waste water and production of chemicals from biological processes. Particular projects include: • Determining the best ways of sequestering CO2 biologically • Determining limiting factors for growth of algae. • Anaerobic Digestion	3
Prof D. Hildebrandt Prof D. Glasser Mr S. Wabula	Comminution: Improving efficiency of commination circuits. Particular projects include: • Determining the energy intensity profile in a mills to minimize production of fines • Liberation of coal from waste rock/ash by the correct grind policy • Optimization of combined comminution – leaching circuits and comminution- flotation circuits • Selective recovery or liberation of minerals by choice of correct grind policy	3
Prof D. Hildebrandt Prof D. Glasser Dr. M. Peters	Separation: Improving efficiency of separation systems, and in particular distillation and membrane separation systems. Particular projects include: • Using column profile maps to improve the current methods of design in chemical processes • Separation of diesel from FT product streams • Developing methods and processes for membrane separation • Development of software for automating Column Profile design methods.	3
Prof D. Hildebrandt Prof D. Glasser	Attainable Regions: Optimization of chemical reactor networks.	2

6.2.3.3 Modes of supervision for MaPS

Projects are modeled around the interests and expertise of the MaPS group and are also based on available infrastructure. In addition to this, in experimental topics, the student has to have routine access to laboratory and analytical facilities. We would like to meet all students regularly to discuss progress on research. Typically we would prefer to meet students weekly.

In-house/on-site supervision: (Preferred mode of supervision)

Unisa has access to facilities to support cutting-edge research. This model works well for full time students who are based on the UNISA Florida campus. The prospective student is expected to liaise with the MaPS post graduate coordinator for possible placement in terms of field of interest (project choice), availability of laboratory space, etc. The prospective student is then allowed to apply to UNISA for possible admission into the MTech, MSc or PhD program.

Split-site supervision: (Only in exceptional circumstances with special permission from the Director of MaPS)

This arrangement is limited to or applies to candidates who are permanently employed in academia or industry with adequate laboratory and analytical facilities. The candidate would also need to demonstrate that they have sufficient time outside of their normal work commitments to successfully complete their research. The arrangement is also applicable to students outside SA provided they have access to adequate laboratory facilities. The student registers with UNISA for higher degree studies. The candidate is expected to make prior arrangement with his/her host institution or company for support in terms of laboratory space, time and running costs

6.2.3.4 Opportunities for external supervision

Currently no new opportunities for external supervision for 2016 are available.

6.2.3.5 Contact details for MaPS

Entity	Name	Designation	Telephone	e-mail
MaPS	Ms Genevieve Ngubane	Post graduate coordinator MaPS	011 670 9037	ngubag@unisa.ac.za
	Dr Y Yao	Head of Graduate Studies	011 670 9030	yaoy@unisa.ac.za

6.3 Projected 2016 supervisory capacity: School of Science

The following sections specify the available capacity for postgraduate supervision for 2016 for the departments of Chemistry, Physics, Mathematics and Statistics.

6.3.1 Department of Chemistry

6.3.1.1 2016 Research Projects that students can participate in

No research projects that students can participate in have been specified.

6.3.1.2 Research focus areas of individual study leaders

Name of supervisor	Broad Research Focus areas	No of positions for Masters students still available for 2016	No of positions for Doctoral students still available for

			2016
Prof MJ Mphahlele	Organic Chemistry	3xMSc	2xPhD
Prof F. Tafesse	Inorganic chemistry	3xMSc	2xPhD
Prof MM Nindi	Analytical Chemistry	3xMSc	2xPhD
Prof GJ Summers	Organic Polymer Chemistry	3xMSc	2xPhD
Prof. S. Dube	Analytical Chemistry	1xMSc	
Prof CA Summers	Organic Polymer Chemistry	1xMSc	
Mr. H Clayton	Inorganic Chemistry	1xMSc	

6.3.1.3 Modes of supervision in the Department of Chemistry

No single student can afford the costs associated with chemistry practicals or research. Projects are modeled around the supervisor's line of interest and expertise and are also based on available infrastructure and expertise. In addition to this, the student has to have routine access to laboratory and analytical facility, which can only be provided by the host institutions, either a university or industry. Moreover, due to the nature and complexity of chemistry projects, direct supervision of the students is critical.

In-house/on-site supervision: (Preferred mode of supervision)

Unisa has adequate laboratories and pieces of analytical equipment to support cutting-edge research. This model works well for non-employed students with no direct access to laboratory and analytical facility. The prospective student is expected to liaise with the potential supervisor for possible placement in terms of field of interest (project choice), availability of laboratory space, etc. The prospective student is then allowed to apply to UNISA for possible admission into MSc or PhD program within the specified sub-discipline of chemistry with the name of the prospective supervisor. Depending on the track record of the prospective supervisor, the Department may appoint an additional co-supervisor within the department or from another institution to support the student.

Split-site supervision: (Only in exceptional circumstances with special permission from the COD of the Department of Chemistry)

This arrangement is limited to or applies to candidates who are permanently employed in academia or chemical industry with adequate laboratory and analytical facilities. It is also applicable to students outside SA provided they have access to adequate laboratory facilities. The student registers with UNISA for higher degree studies. The candidate is expected to make prior arrangement with his/her host institution for support in terms of laboratory space, time and running costs. The Department of Chemistry appoints an internal supervisor for accreditation and quality assurance. Another expert on the site of the student chosen is appointed by the department as co-supervisor to provide the necessary guidance and support to the student. The student may be expected to spend some time on either site to achieve the set project goals. Here, the Department of Chemistry and the host institution share costs in terms of chemicals and analytical facilities.

6.3.1.4 Opportunities for external supervision

This option does not work for independent students due to the nature of chemistry research. Moreover, each student requires continuous guidance, counseling and support as well as routine access to laboratory facility throughout the project. An external supervisor cannot provide such support, unless the student resides in the supervisor's laboratory.

6.3.1.5 Contact details for the Department of Chemistry

Entity	Name	Designation	Telephone	e-mail
Department of Chemistry	Prof MJ Mphahlele	COD	011 670 9301	mphahmj@unisa.ac.za

6.3.2 Department of Mathematics

6.3.2.1 2016 Research Projects that students can participate in

Please see the research focus areas specified in section 6.3.2.2.

6.3.2.2 Research focus areas of individual study leaders

Supervisor name	Research focus area	No of available positions for master's students for 2016	No. of available positions for doctoral students for 2016
Prof T.A. Batubenge	Differential Geometry	2	2
Prof J. Botha	Matrix Theory and Linear Algebra	2	2
Dr E.F. Doungmo Goufo	Epidemiology	1	1
Prof T. Dube	Categorical Algebra and Topology, Pointfree Topology	2	2
Dr P. Ghosh	Topology, Algebra, Pointfree Topology, Category Theory	1	1
Dr L. Godloza	Associative Rings	1	1
Prof Y. Hardy	Linear and Multilinear Algebra	2	2
Dr O. Ighedo	Pointfree Topology	1	1
Prof H. Jafari	Fractional Differential Equations	2	2
Prof S.J. Johnston	Special functions & Orthogonal Polynomials	1	1
Dr A. Kubeka	Cosmology	1	1
Dr. L. Lindeboom	Functional Analysis	1	1
Dr. J. Manale	Differential Equations, Symmetry Analysis, Lie Algebra	1	1
Prof R. Maritz	Fluid Dynamics, Epidemiology	2	2
Dr. M. Moremedi	Fluid Dynamics	1	1
Dr Z. Mpono	Group Theory	1	1
Dr. J. Munganga	Fluid Dynamics, Epidemiology	1	1

Prof I. Naidoo	Pointfree Topology	1	1
Prof D. Smits	Binary Stars, Masers	2	2
Prof S. van Aardt	Graph Theory	2	2

6.3.2.3 Modes of supervision in the Department of Mathematics

The current mode of supervision in the Department of Mathematics entails one-on-one supervision. Where desirable a co-supervisor may also be appointed.

6.3.2.4 Opportunities for external supervision

Currently no new opportunities for external supervision for 2016 are available.

6.3.2.5 Contact details for the Department of Mathematics

Entity	Name	Area of interest	Telephone	e-mail
Department of Mathematics	Prof J Botha	Mathematics	011 670 9167	bothajd@unisa.ac
Department of Mathematics	Prof Y Hardy	Mathematics	011 471 3671	hardyy@unisa.ac.za
Department of Mathematics	Prof R Maritz	Applied Mathematics	011 670 9192	maritr@unisa.ac.za
Department of Mathematics	Prof D Smits	Astronomy	011 670 9149	smitsdp@unisa.ac.za

6.3.3 Department of Physics

6.3.3.1 2016 Research Projects that students can participate in

Name of project leader	Name of project	Brief Description of the project	No of available positions for Master's students for 2016	No. of available positions for PhD students for 2016
Prof ML Lekala	Computational & Theoretical Nuclear Physics	Few-body Physics of light nuclear and superheavy elements	2	2
Prof GJ Rampho	Computational & Theoretical Nuclear Physics	Few-body Physics & hypernuclear Physics	2	2
Dr SJ Moloi	Experimental Solid State Physics	Characterization of diodes and other semiconductor devices	1	0
Prof Vallabhapurapu	Experimental Solid State	Nanotechnology and	4	4

	Physics	materials synthesis; Superconductivity		
Prof Dhlamini	Experimental Solid state Physics	Nanotechnology and synthesis of nanomaterials	2	2
Dr Mothudi	Experimental Solid State Physics	Nanotechnology and synthesis of nanomaterials	2	2
Prof Braun	Computational & Theoretical Nuclear Physics	Few-body Physics, Inverse scattering; computational physics methods	2	2
Prof Botha	Computational Condensed Matter Physics	Semiconductor Physics	2	2
Dr Azemtsa-Donfack	Computational Condensed Matter Physics	Semi-conductor Physics; Theoretical Nuclear Physics Methods	1	0
Dr Tibane	Computational Condensed Matter Physics	Material Science	1	0
Dr Benecha	Computational Condensed Matter Physics	Material Science	1	0

6.3.3.2 Research focus areas of individual study leaders

Name of supervisor	Research focus area	No of positions for Masters students still available for 2016	No of positions for Doctoral students still available for 2016
Prof M. Braun	Computational Physics	1	1
Prof Lekala	Computational Physics	1	1
Prof Rampho	Computational Physics	1	1
Prof Botha	Computational Physics	1	1
Prof Dhlamini	Experimental Physics	1	1
Prof Vallabhapurapu	Experimental Physics	2	2
Dr Mothudi	Experimental Physics	1	1
Dr Moloi	Experimental Physics	1	0
Dr Azemtsa-Donfack	Computational Physics	1	0
Dr Tibane	Computational Physics	1	0
Dr Benecha	Computational Physics	1	0

6.3.3.3 Modes of supervision in the Department of Physics

The current mode of supervision in the Department of Physics entails one-on-one supervision. Where desirable a co-supervisor may also be appointed.

6.3.3.4 Opportunities for external supervision

The following opportunities exist for external supervision:

Name of external supervisor	Organisation	Brief description of research opportunities available	No of available positions for Master's students for 2016	No. of available positions for PhD students for 2016
Prof A Denikin	Joint Institute for Nuclear Research, Russia	Reactions involving exotic nuclei;	1	1
Prof A Karpov	Joint Institute for Nuclear Research, Russia	Theoretical study of synthesis of super-heavy nuclei	1	1
Prof Maaza	UNESCO-UNISA-iThemba LABS	Nanotechnology and synthesis of nanomaterials	4	2
Prof McPherson	Cape Peninsula University of Technology	Semiconductor Physics	1	1
Dr. Msimanga	iThemba LABS (Gauteng)	Semiconductor Physics	1	1
Prof Hille	CSIR	Nanotechnology and synthesis of nanomaterials	1	1

6.3.3.5 Contact details for the Department of Physics

Entity	Name	Telephone	e-mail
Department of Physics	Prof ML Lekala	011 670 9078	lekalml@unisa.ac.za
Department of Physics	Ms BK Ndala	011 670 9066	ndalbk@unisa.ac.za

6.3.4 Department of Statistics

6.3.4.1 2016 Research Projects that students can participate in

No research projects that students can participate in have been specified.

6.3.4.2 Research focus areas of individual study leaders

Supervisor Name	Research interest /Field of expertise	No of positions for Master's students still available for 2016	No of positions for Doctoral students still available for 2016
Prof PM Njuho	Application of meta-analysis to agricultural studies Scientific data management strategies and software use Linear mixed models Design of small and large-scale surveys studies Epidemiology and health related studies Design of experiments for replicated and non-replicated trials Biometrical approaches to agricultural-based (on-station and on-farm) experiments Statistical analysis of gender related studies	2	1
Ms MA Managa	Biostatistics, Demography	1	
Mr TP Mohlala	Reliability theory; Point and Poisson Processes; Maintenance theory; Stochastic process in finance	1	
Dr E Rapoo	Stochastic Processes	1	1
Ms S Muchengetwa	Multivariate analysis i.e. logistic regression, factor analysis, cluster analysis, correspondence analysis, MANOVA, multiple regression, discriminant analysis , log linear analysis , missing value analysis, sampling techniques, distribution theory	1	
Prof JO Olaomi	**Operations Research** Patient Flow problems (Queuing theory) Scheduling / Network problems (Shortest route, CPM, PERT) Mathematical programming - Linear, Integer and Dynamic **Time Series Econometrics**	1	1

	Endogeneity problems Outliers investigations in Time Series Data or in Structural Equation problems Modelling of economic variables Causality Problems Modelling structural equation problems Estimations in the presence of Least Squares violations Canonical Correlations Time series modelling		
Prof N Ndlovu	Construction of optimal designs for nonlinear estimation	1	1
Dr Ranganai	Quantile Regression Regression diagnostics Time series: Time domain and frequency domain	1	1

6.3.4.3 Modes of supervision in the Department of Statistics

The current mode of supervision in the Department of Statistics entails one-on-one supervision. Where desirable a co-supervisor may also be appointed.

6.3.4.4 Opportunities for external supervision

Currently no new opportunities for external supervision are available for 2016.

6.3.4.5 Contact details for the Department of Statistics

Entitity	Name	Telephone	e-mail
Department of Statistics	Dr E Rapoo (COD)	011 670 9255	rapooe@unisa.ac.za

6.3.5 Projected 2016 supervisory capacity: Institute for Nanotechnology and Water Sustainability (NanoWS)

6.3.5.1 Specific projects that students can participate in:

Project Leader	Name of project	Brief Description of the project	No. of available positions for 2016 for students

			registering for PhD
Prof Sabelo D Mhlanga	1. Synthesis and modification of polyethersulfone (PES) – polyethyleneimine (PEI) cross-linked polymeric membranes for selective removal/recovery of heavy/precious metals from water. 2. Development of novel membrane bioreactor materials based on nanotechnology for onsite wastewater purification in rural and semi-urban communities. 3. Solar enabled nanostructured materials for use in drinking and waste water treatment.	1. The main aim of the project is to synthesize and modify novel polymeric polyethersulfone (PES) – polyethyleneimine (PEI) cross-linked membrane to achieve hydrophilic properties, enhanced antifouling properties for the efficient removal of various toxic heavy metals from wastewaters. The materials will also be functionalized with specific functional groups for selective recovery of precious metals. The will also be tested for treatment of AMD. 2. The project will focus on the development suitable membrane materials based on nanotechnology for application in onsite membrane based bioreactors in rural and semi-urban (locations) areas in South Africa. The overall aim is to provide solutions to some of the sanitation problems facing South Africa. 3. This project will focus developing nanomaterials which are carbon and metal based nanospheres with the ability to harvest solar energy. These materials will be incorporated in solar enhancing domes to create advanced water treatment technology. Furthermore, Integration of carbon and metal based nanoparticles into the solar energy concentration domes will be for the distillation of urea from urine and urine combine with grey water and this form part of nutrient recycling. The	5

		collected urea is converted to fertilizers either as urea or ammonia and it is separated from the other nutrients and water. The water can be re-used in agricultural activities.	
Prof Edward Nxumalo	1. Carbon nanotube/polymer mixed matrix membranes for water treatment 2. Engineered vertically-aligned carbon nanotube membranes with enhanced properties for desalination 3. Investigating the surface chemistries of interfacially polymerised membranes 4. Preparation and characterization of multipores hollow fiber UF membranes for drinking water	1. This work is concerned with the manufacture, chemical and physical properties, and effective application in water treatment of polymer based membranes incorporating CNTs. The CNT used are either functionalised with oxygen surface groups or doped with heteroatoms such as nitrogen. 2. This study employs well known chemical vapour deposition techniques using suitable inorganic substrates to make VA-CNTs for the removal of divalent salts from water. The theoretical experiments involves the manipulation of the CNT diameters and the spaces between the CNTs to give highly permeable membrane sheets. 3. This work describes the fabrication of novel nanoparticle/polyamide thin-film nanocomposite membranes by the interfacial polymerization of a thin polyamide layer over a polyethersulfone (PES) support layer or CNT/PES layer. This research further focuses on various ways of modification to improve membrane selectivity, mechanical strength, fouling resistance, and chemical stability. 4. This research focuses on various ways of modification to improve polysulfone and polyethersulfone membrane selectivity, mechanical strength, fouling resistance, and chemical stability using	4

		electrospinning processes.	
Prof Ajay Mishra	1. Synthesis, Characterization and Application of Polymer Nanocomposites and membrane technology for waste water treatment 2. Removal of organic, inorganic and dyes from waste water using nanocatalysts/nanomaterials	1. This project will focus on the synthesis, characterization and applications of various polymer composites/nanocomposites for the waste water treatment. Nanoparticles/microparticles will be incorporated to enhance the application and properties of the resulting materials. The application will be widely cover the areas like thermal, mechanical, luminescent and water purification. 2. This project will be based on synthesis of a series of nanomaterials for the possible application in removal of inorganic and dyes from waste water. These nanomaterials will be also doped to get the desired properties. The materials will be characterized by Raman spectroscopy, Fourier transform infrared spectroscopy (FTIR), X-ray diffraction (XRD), scanning electron microscopy (SEM)-EDS, Transmission electron microscopy (TEM) and UV/Visible spectrophotometry.	2
Prof Titus Msagati	1. Nanopesticides: Environmental fate, distribution and toxicity in aquatic system	1. Nanopesticides refers to any pesticide formulation that (a) contain entities that are falling within the nanometer size range (i.e., up to 1000 nm), (b) is associated with a “nano” terminologies such as nanohybrid or nanocomposite), and/or (c) is known to possess peculiar or novel properties such as those observed with nano materials. Currently there are only very few reports on the environmental fate of nano pesticides, their distribution and toxicity. This study will therefore contribute to the knowledge that may lead to the establishment of guidelines and	5

		regulation of these formulations. The project will develop novel analytical, bioanalytical and biochemical methods to achieve the objectives of the study. The project will establish biochemical pathways of selected nanopesticide formulations and establish their toxicities. The study will also investigate the distribution kinetics pattern, mobility and the metabolites that form in aquatic organisms.	
	2. Biochemical and environmental pathways and Toxicology of micro and nanoplastics in aquatic environments	2. The project will focus on the monitoring of micro/nanoplastics in water reservoirs e.g. dams to establish the extent of pollution due to these species. Focus will be on all the dams in all provinces in South Africa while aquatic animal and water will be the samples to be collected for analysis. It will also entail the study of the fate, behaviour and toxicity of micro and nanoplastics, establish metabolic pathway in aquatic organisms, and to investigate their distribution pattern.	
	3. Investigation of stressing factors responsible for the biosynthesis of biotoxins in aquatic harmful algae and aquatic fungi**.**	3. Aquatic microorganisms such as cyanobacteria and fungi have been known to cause poor water quality imparting an undesirable odour and taste to water. Moreover they produce biotoxins which affect human health when polluted water is ingested. The mechanisms at which these biotoxins are regulated are not known. The aim of this project is to investigate factors that lead to the up-regulations of these aquatic biotoxins.	
	4. The occurrence, risk	4. The presence of pharmaceutical and	

	assessment and biochemical pathways of pharmaceuticals and personal care products (PPCPs) in surface, ground water and wastewater systems	personal care products (PPCPs) such as pharmaceutical/medicinal products, insect repellents, fumigants, sunscreens, perfumes, soaps, detergents, cleaning solutions, fragrances, lotions and their degradation products in aquatic systems has been an issue that has drawn the attention of many scientists. These molecules can get into the aquatic environment after being disposed from the stores, domestic setups, industries etc. These molecules and their metabolites are suspected to be a health hazard, with some suspected endocrine disrupting chemicals. Currently there are no universal guidelines or regulations and in addition to this, methods for their analysis, removal and toxicity are not in existence. Their fate and behavior in aquatic systems is not well known. A few studies that exist are inadequate to explain their behavior in different types of water systems, or their fate, behavior and distribution in the water or in cases of ingestion. This proposed project seeks address all these issues.	
Dr Thabo T Nkambule	Natural organic matter (NOM) in the water treatment process (and cooling waters): characterization, treatability, removal and development of techniques for NOM and DBP's efficient removal in water	An emerging environmental concern is the presence of natural organic matter (NOM) in water systems. The prevalence of NOM in water remains a huge challenge for water supplying companies and municipalities responsible for its distribution. The greatest drawback is that the character and composition of NOM in South Africa is not clearly understood, thus resulting in an inefficient treatment process for its removal. This project thus presents an evaluation of NOM in dams, water distribution channels as well as water treatment plants to monitor	2

		the occurrence of NOM and develop an effective rapid NOM characterization and removal protocol by treatment plants.	

6.3.5.2 Research focus areas of individual study leaders

Name of supervisor	Brief Description of research focus area	No. of available positions for 2016 for students registering for PhD
Prof Bhekie B Mamba	Professor Bhekie Mamba is the Director of the Nanotechnology and Water sustainability Research Unit and his general research interests is developing advanced technologies for water treatment which include nanotechnology and membrane technology. The main interest is the removal of organic micro pollutants in water and improving the efficiency of conventional technologies in dealing with new emerging pollutants through integrating existing technologies with nanotechnology. Professor Mamba has supervised to completion over 60 Masters and doctoral students and has published at least 180 papers in peer-reviewed journals. Besides his established international collaborative research network with other esteemed universities locally and abroad, Prof Mamba has presented his research work in several local and international conferences. Prof Mamba's passion is a creating sustainable solution that would ensure that the water resources are maintained and preserved for future generations.	4
Prof Titus AM Msagati	Prof Msagati is a specialist in method development for the determination of organic and inorganic pollutants. His work also involves: - Aspects of sampling and sample preparation methods, separation and detection of PoPs, emerging micropollutants (nano pesticides, microplastics, etc.), inorganics (nano materials). - Toxicology, fate and distribution of pollutants: Harmful algae secondary metabolites, toxicity of nano materials,	5

	toxic secondary metabolites from microorganisms, etc. -Instrumental methods of analysis: chromatography, hyphenated techniques -Bioremediation of micropollutants – fabrication and use of natural adsorbents (plant extracts, organic wastes, etc.) for the decontamination of polluted aquatic environment (defluoridation, oil remediation spills)	
Dr Thabo T Nkambule	Dr Nkambule's research interests are in drinking and waste water treatment. This involves studying organic pollutants and developing methods for their efficient removal throughout the urban water cycle. His focus is specifically on Natural Organic Matter (NOM) in South African waters, studying its characterization, treatability and method development for effective NOM removal from water. His research also focuses on studying the influence of the size and polarity of NOM on its removal by adsorption and membrane filtration as well as to understand the behavior of the various NOM fractions in drinking water process by modeling. NOM is a highly variable mixture of products found in various types of water and soils, formed as a result of decomposition of plant and animal material into water.	1
Prof J Haarhoff	Drinking water quality and treatment	0
Prof Ajay Mishra	Prof Ajay Mishra's research interest falls under the broad area of Nanomaterials where he is more focussed on fabricating new composite/nanocomposite materials. These materials are widely used in the treatment of water. He supervises students involved in the water treatment research in projects involving heavy metal removal and degradation of various dyes. His research focuses aims at developing a protocol which may lead to developing a technology which may be utilized for industrial purposes.	2
Prof Sabelo D Mhlanga	Prof Mhlanga's research interests involve the development of energy efficient water purification systems using nanotechnology. His approach is to use green chemical strategies to synthesize the various nanomaterials for drinking and wastewater purification including carbon based nano materials, polymeric and polymer-ceramic mixed	5

	matrix membrane filtration materials, novel nano adsorbents. Prof Mhlanga has keen interest in providing water purification and supply solutions for rural communities. Some of the nanomaterials he has produced are used for other applications in areas of catalysis and energy through collaborative projects.	
Prof Edward Nxumalo	Prof Nxumalo's research delves on carbon-based membranes: fabrication, analysis and application (desalination, nanofiltration, *etc*.). The technique uses facile procedures and involves techniques such as phase inversion, interfacial polymerization and electro-spinning. He also has interests on the synthesis and advanced characterization of heteroatomic and doped carbons and the catalytic application of organometallic complexes in the production of nanomaterials e.g. substituted ferrocenes.	3

6.3.5.3 Modes of supervision in NanoWS

Supervised or co-supervised. On-campus presence in laboratories would be required.

6.3.5.4 Opportunities for external supervision in NanoWS

External experts in the field of nanotechnology and/or water research will be invited to act as co-supervisors to selected projects, especially if their contribution is expected to be above that of a collaborator. Any external co-supervisor will be identified by the project leader and recommended by NanoWS directorate prior to approval by the University.
Similarly researchers in NanoWS may act as co-supervisors for projects in other institutions where they hold expertise.

6.3.5.5 Contact details for NanoWS

Entity	Name	Designation	Telephone	e-mail
NanoWS	Prof Bhekie B Mamba	Director	011 670 9840	mambabb@unisa.ac.za

6.3.4 Institute for Science and Technology Education

6.3.4.1 2016 Research Projects that students can participate in

No research projects that students can participate in have been specified.

6.3.4.2 Research focus areas of individual study leaders

Supervisor Name	Research interest /Field of expertise	No of positions for Master's students still available for 2016	No of positions for Doctoral students still available for 2016
Prof Jeanne Kriek	Use of technology in the teaching and learning of physics; conceptual understanding of physics concepts; effective use of simulations in physics	2	2
Prof Nosisi N Feza	Developing researched based models for teaching mathematics concepts across all school levels	3	2
Prof Keshnee Padayachee	Collaborative e-learning; Open, distance and e-learning (ODeL); Information Security	3	3
Prof David Mogari	Problem solving in mathematics; Socio-cultural aspects of mathematics	0	0
Dr Chukunoye Enunuwe Ochonogor	Evolving effective pedagogical approaches for the teaching and learning Chemistry and Science concepts including Chemistry problem-solving at all school levels.	3	2
Prof Harrison Atagana	Science Education and Environmental Education	0	0

6.3.4.3 Modes of supervision in the Institute for Science and Technology Education

The current mode of supervision in the Institute for Science and Technology Education entails one-on-one supervision. Where desirable a co-supervisor may also be appointed.

6.3.4.4 Opportunities for external supervision

Currently no new opportunities for external supervision are available for 2016.

6.3.4.5 Contact details for the Department of Statistics

Entitity	Name	Telephone	e-mail
Institute for Science and Technology Education	Prof Feza (Head of Institute)	012-337-6168	fezann@unisa.ac.za

6.3.6 Projected 2016 supervisory capacity: Institute for Science and Technology Education

Project Leader	Name of project	Brief Description of the project	No. of available positions for 2016 for students registering for PhD
Prof Nosisi N Feza	Evaluation of the effectiveness of professional development that focuses on developing mathematics for teaching knowledge.	Evaluation of a provincial professional development programme with the focus to the impact of the project in nurturing teachers' knowledge of mathematics for teaching.	2
Dr Chukunoye Enunuwe Ochonogor	Effectiveness of ISTE Winter School professional development model for science and technology teachers.	The project determines abstract and difficult MST topics to teach and learn through researches in schools, plans intervention plans for the teachers and evaluates the effectiveness or impact of the intervention model invented by ISTE.	3

7 TYPE 2 INFORMATION (HOW TO PARTICIPATE)

7.1 Type 2 Information on admission requirements for master's degree and MTech applications in CSET

7.1.1 Minimum generic requirements

7.1.1.1 Minimum generic requirements for all applicants in CSET

The following minimum generic requirements are applicable to all applicants for Master's and MTech degrees in CSET:

(1) All students applying have to be in possession of an appropriate honours degree or equivalent 96 credits NQF level 8 qualification (new NQF levels) in the discipline that the applicant wishes to do a master's degree in. The average mark obtained for the honours degree shall be 60%.

(2) All applicants must engage with the relevant academic department and discuss their intended proposed field of specialization and study focus area with academic staff members of the relevant department. The contact points (and first point of entry for all applicants) are the names of the persons supplied in Section 6 of this document. No person will be admitted without record of such an engagement with the relevant department.

(3) All applicants must have a suitable topic (following from the discussions under (1)) prior to admission.

(4) An applicant may only be admitted if the name of a suitable supervisor has been provided by the relevant academic department. The name of the appropriate supervisor will be determined on the basis of areas of expertise/interest and available supervisory capacity of the academic members of staff in the department. Available supervisory capacity will be determined on the basis of the existing approved CSET supervisory capacity guidelines. No applicant will be admitted without a supervisor.

(5) All students need to demonstrate adequate mastery of English as academic language. In this regard students will have to provide evidence of TOEFL (a minimum score of 88 for the Internet-based test or a minimum score of 570 for the paper-based test is required). Exceptions will apply for students who have completed their honours degrees at a university where English is the prime language of instruction. Other exceptions may be considered and approved by the COD on an individual basis.

(6) All students should have had adequate exposure to appropriate research methods and methodologies as part of their previous qualifications.

(7) Students who need to do laboratory work as part of their studies will be subject to residency requirements.

(8) Foreign students will be requested to submit a SAQA evaluation of their qualifications. The evaluation has to indicate that the degree is the equivalent of a South African degree at NQF level 8 (new NQF levels). An academic department may grant an applicant an exemption from this if the student's qualification has been previously accredited and deemed acceptable by Unisa.

(9) In all instances where a student has been refused admission such instances and the reasons for refusal of admission will be submitted to the College Executive Committee for final approval of the decision. Candidates who have been refused may approach the Chair of Department of the relevant department for the reasons of refusal.

(10) In instances where entry to a specific postgraduate qualification and focus area is competitive, selection will be based on the following process (with due regard to redress of past inequalities in the South African educational system):

a. Only candidates who meet the minimum eligibility criteria will be considered
b. Each candidate will be requested to provide a three-page document that needs to provide evidence and arguments on the following: (1)Reasons for wanting to do the qualification and for selecting the specific study area that is being applied for; (2) A proposal on how the applicant intends approaching the studies in order to complete this within the prescribed period of time allowed for the qualification; (3) Commitment to the discipline and the focus area outside of the proposed qualification being applied for; (4) Fundamental understanding of, and experience in appropriate research methods and techniques; (5) Capacity for sustained hard work and academic activity over an extended period of time.
c. These documents will be evaluated on the following basis (weight attached to each criterion is indicated in brackets as a percentage of overall evaluation): (1) Appropriateness of reasons for applying to do the qualification in the indicated study area (15%); (2) Quality and coherence of the reasoning and language use in the document (in English) (30%); (3) Evidence of commitment to the specialist area outside of the proposed qualification (20%); (4) Evidence of the capacity for sustained hard work and academic activity over an extended period of time (15%); (5) Experience in and understanding of research methods as part of previous qualifications (20%).
d. Where any aspect of an application is unclear to the academic department, the departmental representative(s) tasked with evaluating the applications may request an interview with the applicant.
e. The results of the competitive process will be submitted to a departmental committee authorized to approve the results, and unsuccessful applicants may apply for the reasons for rejection of their applications. Unsuccessful applicants have the right to appeal using the appropriate Unisa channels and procedures.

7.1.1.2 Additional minimum requirements for specific departments:

In addition to the CSET minimum generic requirements the following specific additional minimum requirements are valid for specific academic departments:

School of Engineering

At this stage the only postgraduate qualifications available in Engineering at Unisa are MTech degrees. For admission to an MTech qualification the minimum admission for a master's programme is a 60% average in a B Tech: Engineering degree (or equivalent) in the same discipline or relevant field of study.

7.2 Type 2 Information on admission requirements for doctoral applications in CSET

7.2.1 Minimum generic requirements

7.2.1.1 Minimum generic requirements for all applicants in CSET

The following minimum generic requirements are applicable to all applicants for doctoral degrees in CSET:

(1) All students applying have to be in possession of an appropriate master's degree or equivalent 96 credits NQF level 9 qualification (new NQF levels) in the discipline that the applicant wishes to do a master's degree in. The average mark obtained for the master's degree shall be 60%.
(2) All applicants must engage with the relevant academic department and discuss their intended proposed field of specialization and study focus area with academic staff members of the relevant department. The contact people (and first point of entry for all applicants) are the names of the persons supplied in Section 6 of this document. No person will be admitted without record of such an engagement with the relevant department.
(3) All applicants must have a suitable topic (following from the discussions under (1)) prior to admission.
(4) An applicant may only apply for admission if the name of a suitable supervisor has been provided by the relevant academic department. The name of the appropriate supervisor will be determined on the basis of areas of expertise/interest and available supervisory capacity of the academic members of staff in the department. Available supervisory capacity will be determined on the basis of the existing approved CSET supervisory capacity guidelines. No applicant will be admitted without a supervisor.
(5) All students need to demonstrate adequate mastery of English as academic language. In this regard students will have to provide evidence of TOEFL (A minimum score of 88 for the Internet-based test or a minimum score of 570 for the paper-based test is required). Exceptions will apply for students who have completed their honours degrees at a university where English is the prime language of instruction. Other exceptions may be considered and approved by the COD on an individual basis.
(6) All students should have had adequate exposure to appropriate research methods and methodologies as part of their previous qualifications.
(7) Students who need to do laboratory work as part of their studies will be subject to residency requirements.
(8) Foreign students will be requested to submit a SAQA evaluation of their qualifications. The evaluation has to indicate that the degree is the equivalent of a South African degree at NQF level 9 (new NQF levels). An academic department may grant an applicant an exemption from this if the student's qualification has been previously accredited and deemed acceptable by Unisa.
(9) In all instances where a student has been refused admission such instances and the reasons for refusal of admission will be submitted to the College Executive Committee for final approval of the decision. Candidates who have been refused may approach the Chair of Department of the relevant department for the reasons of refusal.
(10) In instances where entry to a specific postgraduate qualification and focus area is competitive, selection will be based on the following process (with due regard to redress of past inequalities in the South African educational system):
    a. Only candidates who meet the minimum eligibility criteria will be considered
    b. Each candidate will be requested to provide a three-page document that needs to provide evidence and arguments on the following: (1)Reasons for wanting to do the qualification and for selecting the specific study area that is being applied for; (2) A proposal on how the applicant intends approaching the studies in order to complete this within the prescribed period of time allowed for the qualification; (3) Commitment to the discipline and the focus area outside of the proposed qualification being applied for; (4) Fundamental understanding of, and experience in appropriate research methods and

techniques; (5) Capacity for sustained hard work and academic activity over an extended period of time.

c. These documents will be evaluated on the following basis (weight attached to each criterion is indicated in brackets as a percentage of overall evaluation): (1) Appropriateness of reasons for applying to do the qualification in the indicated study area (15%); (2) Quality and coherence of the reasoning and language use in the document (in English) (30%); (3) Evidence of commitment to the specialist area outside of the proposed qualification (20%); (4) Evidence of the capacity for sustained hard work and academic activity over an extended period of time (15%); (5) Experience in and understanding of research methods as part of previous qualifications (20%).
d. Where any aspect of an application is unclear to the academic department, the departmental representative(s) tasked with evaluating the applications may request an interview with the applicant.
e. The results of the competitive process will be submitted to a departmental committee authorized to approve the results, and unsuccessful applicants may apply for the reasons for rejection of their applications. Unsuccessful applicants have the right to appeal using the appropriate Unisa channels and procedures.

7.2.1.2 Additional minimum requirements for specific departments:

In addition to the CSET minimum generic requirements the following specific additional minimum requirements are valid for specific academic departments:

School of Science: Department of Chemistry

Applicants need to commit that they can spend at least part of their full-time occupation on research otherwise they will not be accepted for the PhD degree in Chemistry.

7.2.2 Supporting documentation required to accompany all applications for admission

7.2.2.1 Supporting documentation required for all applications in CSET

The following documentation should accompany all applications for Master's qualifications in CSET:

(1) A certified copy of an identity document/passport
(2) Certified transcripts of academic records of previous qualifications obtained
(3) Proof of qualification (Certified copies of certificates of previous qualifications)
(4) A letter from the academic department in CSET where the applicant wishes to study confirming the field of study and the name of the allocated supervisor
(5) Proof of TOEFL language proficiency results, or letter from Unisa stating that the applicant has been exempted
(6) Applicants may be requested to supply detailed syllabi descriptions of their previous qualifications as additional supporting documentation.
(7) In the instance of competitive entry, a three-page document compiled in accordance with specifications set out in Sections 7.1 and 7.2 above has to be submitted by the applicant.

7.2.2.2 Additional supporting documentation required to accompany applications for admission for specific departments in CSET

School of Computing

The three-page document required under point (7) for Section 7.2.2.1 is mandatory for all applications for qualifications in the School of Computing.

Department of Chemistry

For the Department of Chemistry applicants will be required to agree in writing to utilize laboratory facilities at Unisa or have access to a laboratory or facilities suitable for the research work envisaged. In the instance where the applicant will be doing work at laboratory facilities other than those on the Florida Campus of Unisa, the applicant has to supply written confirmation of the availability of alternative laboratory facilities that are acceptable to the Department of Chemistry.

Applicants must also indicate whether he or she wrote an article for his or her honours or master's degree and, if so, must submit a copy thereof.

Department of Statistics

Applicants should submit a provisional five page pre-proposal document as part of the application.

7.2.3 Procedure by which selection of all candidates will be made

7.2.3.1 School of Computing

Selection of possible post graduate candidates will be based upon available capacity with the School of Computing. If no capacity is available in specific research areas, no registration for those research areas will be approved. Applications will be handled in a batch at the end of the application window period. In instances where there are large numbers of competing applicants seeking admission in the same focus areas or with the same supervisors, applicants in these areas that meet the minimum generic admissions requirements will be selected on the basis of the process set out in Sections 7.1 (10) for master's applicants and Section 7.2 (10) for doctoral applicants.

If availability of supervisors is close to capacity preference will be given to South African applicants with due consideration for the redress of previous inequalities in the educational system.

7.2.3.2 All other departments in CSET

Applications for admission are handled on a continuous basis throughout the year. Applicants engage with the relevant academic department in order to discuss intended area of specialization and availability of supervisors in the intended area of specialization. The students submit the relevant documentation online to DSAR as part of application for admission. Once the academic department is satisfied about the applicant's study focus and has sent the applicant the name of the supervisor in writing the applicant may be admitted and registered. Should there be instances where the number of applicants seeking admission in the same focus areas or with the same supervisors exceed the available supervisory capacity, applicants in these areas that meet the minimum generic admissions requirements will be selected on the basis of the process set out in Sections 7.1 (10) for master's applicants and Section 7.2 (10) for doctoral applicants.

If availability of supervisors is close to capacity preference will be given to South African applicants with due consideration for the redress of previous inequalities in the educational system.

7.2.4 Possible alternative opportunities for unsuccessful candidates

7.2.4.1 Possible alternative opportunities for all unsuccessful candidates in CSET

The names of unsuccessful candidates and the reasons for their rejection will be submitted to the College Executive Committee for validation. All unsuccessful candidates may apply for written reasons

for their rejection which shall be supplied in writing by the Chair of the Department of the relevant department.
The following possible alternative opportunities exist for applicants who do not meet the generic admission requirements for CSET:
Generic alternative opportunities for CSET

(1) Applicants with degrees that have different structures from normal South African honours degrees, applicant's whose degrees do not clearly correspond to generic CSET admissions requirements (e.g. no mark awarded for previous dissertations, no clear evidence of having completed a research-related module as part of the previous qualification, etc.), or applicants who do not meet generic admissions requirements but who possess applicable experience in research that may qualify them for admissions to a master's degree will be required to apply for Recognition of Prior Learning (RPL). Prior academic and research activity by the applicant will be evaluated in accordance with formal Unisa RPL procedures and the outcome of the RPL process will be submitted to and approved by the College Executive Committee. If the approved outcome of the RPL process is positive, the applicant will be allowed to proceed with an application for admission, subject to all terms and conditions governing the admissions process.
(2) Students who have been refused admission because of limited capacity within the academic department where the application was made may reapply in subsequent years.

7.2.4.2 Additional possible alternative opportunities for unsuccessful candidates in specific academic departments in CSET

School of Science: Department of Statistics

In instances where a student does not have an average of 60% or more a submission may be made to the Department of Statistics to allow such a student admission. Students must provide a written motivation of not more three pages requesting admission to the department. The department will consider the application, taking into account:

- The relevant experience, work or otherwise, of the student,
- The language capabilities of the student
- Alternative options for access into the programme
- Any other factor deemed necessary by the department

Institute for Science and Technology Education

In instances where a student does not have an average of 60% or more a submission may be made to the Institute for Science and Technology Education to allow such a student admission. Students must provide a written motivation of not more three pages requesting admission to the Institute. The Institute will consider the application, taking into account:

- The relevant experience, work or otherwise, of the student,
- The language capabilities of the student
- Alternative options for access into the programme
- Any other factor deemed necessary by the Institute

8 Type 3 information: When to apply

CSET will have dual application streams:
For the School of Computing applications for admissions and registrations will take place in accordance with dates set by DSAR for bulk applications and registrations.
For all other academic departments in CSET (School of Science and School of Engineering) a continuous applications and admissions process will apply, because of the scarcity of applicants in these research focus areas. Applicants will therefore be allowed to commence with their applications throughout the year, provided that supervisory capacity is available in the area of specialization that the applicant wishes to apply for.

PART B: ADMISSION REQUIREMENTS FOR THE GENERIC PHD IN THE COLLEGE OF SCIENCE ENGINEERING AND TECHNOLOGY (CSET)

7. PREAMBLE

This document should be read in conjunction with the CSET Admissions Requirements document that has been approved by Senate in 2013 (Part A of this document).

Recently CSET has seen significant growth in productivity and impact of its research activities. A significant factor in this growth has been the establishment of two research institutes within CSET; these are Institutes for Materials and Process Synthesis (MaPS) and Nanotechnology for Water Sustainability (NanoWS).

Given the focus areas of these institutes, research activities in both these institutes are within the multi-, inter- and trans-disciplinary space.

Given the high scholarly profiles of both institutes they are attractive to postgraduate students and the structures of these institutes also are supportive of high throughput rates of students who register to do postgraduate studies with them.

However, currently the postgraduate landscape in CSET only allows for students to register for PhD's in specific scientific disciplines (e.g. Chemistry or Physics). This is obviously not ideal for these institutes, and the need has therefore arisen within CSET to allow doctoral students to register for a PhD that would allow for non-discipline specific research within an MIT space.

The recent rationalization of PhDs within Unisa has allowed for the creation of a generic PhD for the institution. The generic nature of this qualification would allow students registered for it to engage with MIT-focused research.

This document contains the admission requirements for students intending to register for a generic PhD in CSET. The information contained in this document is intended to align admission to this qualification in CSET with Unisa's Senate approved M&D policy and procedures as well as CSET Senate approved Postgraduate Admissions Requirements and contains the required information in terms of:

- entrance requirements for students in the College of Science Engineering and Technology intending to register for the generic PhD (in order to ensure that the quality of incoming students are such that they have an optimal chance of completing their qualifications);
- Showing specific research focus areas in the college where there is supervisory capacity for these students, which facilitates the choice for students in term of the focus of specific programmes and projects and ensures that available supervisory capacity is not exceeded.

8. PURPOSE AND AIMS OF THIS SECTION

At the 13 March 2013 meeting Senate resolved regarding the Unisa Policy on Master's and Doctoral Degrees as follows:

> "*(1) That the Policy on Master's and Doctoral Degrees be recommended to Council for approval; (2) That the selection criteria in the document "Processes for Master's and Doctoral Research Degrees" be approved; (3) That for the purposes of approval, the dates indicated in the document "Processes for Master's and Doctoral Research Degrees (2014)" be deleted; (4) That the accompanying narrative document be approved*."

This document sets out the requirements of the approved narrative document as these would relate to the generic PhD. Three types of information have to be provided by the College, and the Institutes , viz. *(1) the research opportunities and available supervision capacity; (2) the selection criteria in the form of requirements to be satisfied and information to be provided by the prospective candidate on the basis of which the admission application will be assessed, and (3) propose possible differentiated registration dates, college specific due dates and admission and registration information to suit the needs of the various colleges, schools and departments in accepting M&D candidates taking into account the proposed dates on the diagram and subsidy cut off dates.*

This document is applicable to the College of Science Engineering and Technology, and institutes that do research that would require students to register for the generic PhD due to the MIT nature of the research spaces in which they would be doing their research.
For each of the types of information required the document firstly sets out information that is applicable to these institutes, and then provides specific additional information that applies uniquely to institutes.

The proposals contained in this document have been disseminated and discussed within the College and have served at various College structures, including the College Director's Forum and the College Board. The College Board approved the requests below for submission to the Intercollege Board for scrutiny on behalf of the Senate Higher Degrees Research and Innovation Committee and Senate.

In order to therefore fulfill the requirements in the narrative document adopted by Senate, the College of Science Engineering and Technology requests approval of the following opportunities, selection criteria and related information, and admission and registration information for admission to the generic PhD as stipulated below.

UNISA | college of science, engineering and technology

9. TYPE 1 INFORMATION (OFFERINGS TO POTENTIAL POSTGRADUATE STUDENTS FOR THE GENERIC DEGREE)

This document sets out the projected supervisory capacity for 2014 for higher degrees (MSc, MTech and PhD) of the various departments and schools in the College of Science, Engineering and Technology. The supervisory capacity is indicated per school for the School of Computing, the School of Engineering (Departments of Electrical and Mining Engineering, and Civil and Chemical Engineering) and the School of Science (Departments of Physics, Chemistry, Mathematics and Statistics).

9.1 Projected 2016 supervisory capacity: Institute for Materials and Process Synthesis (MaPS)

9.1.1 Specific projects that students can participate in:

Project Leader	Name of project	Brief Description of the project	No. of available positions for 2016 for students registering for the generic PhD
Prof Hildebrandt and Dr Sempunga	Process Synthesis	Fundamental thermodynamics can be used to design process flow-sheets for chemical plants in order to, for instance, minimize carbon dioxide emissions and improve the efficient use of raw materials. There are essentially three principles that can be used to synthesize flow-sheets; these are an overall mass balance, a constraint called the energy balance and another which is essentially a work balance. The idea is that the feed materials have chemical potential and to make the most efficient plant we need to conserve this chemical potential in the products, whether they are chemicals or direct work outputs such as electricity. This research looks at developing flow sheets using these fundamental principles.	6

Prof Hildebrandt and Dr Liu	Fischer Tropsch	The Fischer-Tropsch reaction is very important industrially as it is used to make synthetic fuels from coal, oil and as now envisaged, organic wastes. While this reaction has been studied for over 80 years there is still much mystery about it and there are many unexplained phenomena. We are currently working on building small-scale modular units to use organic feedstocks (e.g. agricultural waste, municipal solid waste and medical waste) to supply fuel and electricity to local areas.	12
Prof Hildebrandt	Attainable Regions	There are many types of chemical reactor used in practice. An important question is given the kinetics of a reaction system what is the best reactor system to use to optimise some objective. A new method for optimising chemical reactors called the Attainable Region (AR) method, based on graphical ideas can readily solve this question. We are looking at automating the method and extending the approach to higher dimensions.	4
Prof Hildebrandt and Prof Mulenga	Minerals Processing	Comminution is a very important operation in the mineral processing industry particularly as in order to extract minerals from rock it has to be broken up into fine particles. This is a very energy intensive process. Particle break down systems can be described as reaction type systems where the kinetics are essentially the breakdown rates of particles of various sizes. Thus all the power of the AR methods could be brought to bear on these processes. Much experimental work on various ores has been done and it has been shown that by controlling the comminution there can be significant improvements in the product specifications (amount of particles in the desired size range) and the energy required to do this. Work is continuing in this area with us expanding the approach in flotation and leaching.	10
Prof Hildebrandt and Dr Peters	Separation System	Distillation is one of the most common methods of separation in the chemical industry but it is	4

	Synthesis	very energy intensive. There was a need for new methods to design distillation systems to be more energy efficient. A new method for distillation system design called the Column Profile Map (CPM) method has been developed by members of MaPS. We are looking at using this approach to develop more energy efficient complex columns as well as synthesis membrane separation systems.	
Prof Hildebrandt and Dr Matambo	Bio-Technology	Algae can sequestrate CO_2. We have a research programme to find the factors that can improve the growing rate of algae. Water is scare in Africa and we are looking at ways of purifying water using passive systems, such as artificial wetlands. We are also looking at bio-digesters and the limits of performance of these systems. In this way we can determine the amount of energy that can be produced from a feedstock.	10

9.1.2 Research focus areas of individual study leaders

Name of supervisor	**Brief Description of research focus area**	**No. of available positions for 2016 for students registering for the generic PhD**
Prof Hildebrandt	Process synthesis; Fischer Tropsch; Separation System Synthesis; Attainable Regions; Minerals Processing; Bio-Technology	14
Dr Matambo	Bio-Technology	10
Dr Liu	Fischer Tropsch	3

Dr Lu	Fischer Tropsch	3
Dr Yao	Fischer Tropsch	3
Dr Peters	Separation System Synthesis	4
Dr Sempunga	Process synthesis	2
Dr Fox	Process synthesis	2
Dr Zhu	Fischer Tropsch	3
Dr Ngubevana	Process synthesis	2

9.1.3 Modes of supervision in MaPS

The current mode of supervision in the MaPS entails group supervision. Co-supervisors are usually appointed.

9.1.4 Opportunities for external supervision in MaPS

No current opportunities exist.

9.1.5 Contact details for MaPS

Entity	Name	Designation	Telephone	e-mail
MaPS	Ms Genevieve Ngubane	PG Officer	0116709037	ngubag@unisa.ac.za

9.2 Projected 2016 supervisory capacity: Institute for Nanotechnology and Water Sustainability (NanoWS)

9.2.1 Specific projects that students can participate in:

Project Leader	Name of project	Brief Description of the project	No. of available positions for 2016 for students registering for the generic PhD

Prof Sabelo D Mhlanga	Synthesis and modification of polyethersulfone (PES) – polyethyleneimine (PEI) cross-linked polymeric membranes for selective removal/re covery of heavy/precious metals from water. Development of novel membrane bioreactor materials based on nanotechnology for onsite wastewater purification in rural and semi-urban communities. Solar enabled nanostructured materials for use in drinking and waste water treatment.	The main aim of the project is to synthesize and modify novel polymeric polyethersulfone (PES) – polyethyleneimine (PEI) cross-linked membrane to achieve hydrophilic properties, enhanced antifouling properties for the efficient removal of various toxic heavy metals from wastewaters. The materials will also be functionalized with specific functional groups for selective recovery of precious metals. The will also be tested for treatment of AMD. The project will focus on the development suitable membrane materials based on nanotechnology for application in onsite membrane based bioreactors in rural and semi-urban (locations) areas in South Africa. The overall aim is to provide solutions to some of the sanitation problems facing South Africa. This project will focus developing nanomaterials which are carbon and metal based nanospheres with the ability to harvest solar energy. These materials will be incorporated in solar enhancing domes to create advanced water treatment technology. Furthermore, Integration of carbon and metal based nanoparticles into the solar energy concentration domes will be for the distillation of urea from urine and urine combine with grey water and this form part of nutrient recycling. The collected urea is converted to fertilizers either as urea or ammonia and it is separated from the other nutrients and water. The water can be re-used in	3

		agricultural activities.	
Prof Edward Nxumalo	Carbon nanotube/polymer mixed matrix membranes for water treatment	This work is concerned with the manufacture, chemical and physical properties, and effective application in water treatment of polymer based membranes incorporating CNTs. The CNT used are either functionalised with oxygen surface groups or doped with heteroatoms such as nitrogen.	4
	Engineered vertically-aligned carbon nanotube membranes with enhanced properties for desalination	This study employs well known chemical vapour deposition techniques using suitable inorganic substrates to make VA-CNTs for the removal of divalent salts from water. The theoretical experiments involve the manipulation of the CNT diameters and the spaces between the CNTs to give highly permeable membrane sheets.	
	Investigating the surface chemistries of interfacially polymerised membranes	This work describes the fabrication of novel nanoparticle/polyamide thin-film nanocomposite membranes by the interfacial polymerization of a thin polyamide layer over a polyethersulfone (PES) support layer or CNT/PES layer. This research further focuses on various ways of modification to improve membrane selectivity, mechanical strength, fouling resistance, and chemical stability. This research focuses on various ways of modification to improve polysulfone and polyethersulfone membrane selectivity, mechanical strength, fouling resistance, and chemical stability using electrospinning processes.	

	Preparation and characterization of multipores hollow fiber UF membranes for drinking water		
Prof Ajay Mishra	Synthesis, Characterization and Application of Polymer Nanocomposites and membrane technology for waste water treatment Removal of organic, inorganic and dyes from waste water using nanocatalysts/nanomaterials	This project will focus on the synthesis, characterization and applications of various polymer composites/nanocomposites for the waste water treatment. Nanoparticles/microparticles will be incorporated to enhance the application and properties of the resulting materials. The application will be widely cover the areas like thermal, mechanical, luminescent and water purification. This project will be based on synthesis of a series of nanomaterials for the possible application in removal of inorganic and dyes from waste water. These nanomaterials will be also doped to get the desired properties. The materials will be characterized by Raman spectroscopy, Fourier transform infrared spectroscopy (FTIR), X-ray diffraction (XRD), scanning electron microscopy (SEM)-EDS, Transmission electron microscopy (TEM) and UV/Visible spectrophotometry.	2
Prof Titus Msagati	Nanopesticides: Environmental fate, distribution and toxicity	Nanopesticides refers to any pesticide formulation that (a) contain entities that are falling within the nanometer	5

	in aquatic system 5. Biochemical and environmental pathways and Toxicology of micro and nanoplastics in aquatic environments	size range (i.e., up to 1000 nm), (b) is associated with a "nano" terminologies such as nanohybrid or nanocomposite), and/or (c) is known to possess peculiar or novel properties such as those observed with nano materials. Currently there are only very few reports on the environmental fate of nano pesticides, their distribution and toxicity. This study will therefore contribute to the knowledge that may lead to the establishment of guidelines and regulation of these formulations. The project will develop novel analytical, bioanalytical and biochemical methods to achieve the objectives of the study. The project will establish biochemical pathways of selected nanopesticide formulations and establish their toxicities. The study will also investigate the distribution kinetics pattern, mobility and the metabolites that form in aquatic organisms. 5. The project will focus on the monitoring of micro/nanoplastics in water reservoirs e.g. dams to establish the extent of pollution due to these species. Focus will be on all the dams in all provinces in South Africa while aquatic animal and water will be the samples to be collected for analysis. It will also entail the study of the fate, behaviour and toxicity of micro and nanoplastics, establish metabolic pathway in aquatic organisms, and to investigate their distribution pattern. 6. Aquatic microorganisms such as cyanobacteria and fungi have been	

	Investigation of stressing factors responsible for the biosynthesis of biotoxins in aquatic harmful algae and aquatic fungi.	known to cause poor water quality imparting an undesirable odour and taste to water. Moreover they produce biotoxins which affect human health when polluted water is ingested. The mechanisms at which these biotoxins are regulated are not known. The aim of this project is to investigate factors that lead to the up-regulations of these aquatic biotoxins.	
	The occurrence, risk assessment and biochemical pathways of pharmaceuticals and personal care products (PPCPs) in surface, ground water and wastewater systems	The presence of pharmaceutical and personal care products (PPCPs) such as pharmaceutical/medicinal products, insect repellents, fumigants, sunscreens, perfumes, soaps, detergents, cleaning solutions, fragrances, lotions and their degradation products in aquatic systems has been an issue that has drawn the attention of many scientists. These molecules can get into the aquatic environment after being disposed from the stores, domestic setups, industries etc. These molecules and their metabolites are suspected to be a health hazard, with some suspected endocrine disrupting chemicals. Currently there are no universal guidelines or regulations and in addition to this, methods for their analysis, removal and toxicity are not in existence. Their fate and behavior in aquatic systems is not well known. A few studies that exist are inadequate to explain their behavior in different types of water systems, or their fate, behavior and distribution in the water or in cases of ingestion. This proposed project seeks address all these issues.	

Dr Thabo T Nkambule	Natural organic matter (NOM) in the water treatment process (and cooling waters): characterization, treatability, removal and development of techniques for NOM and DBP's efficient removal in water	An emerging environmental concern is the presence of natural organic matter (NOM) in water systems. The prevalence of NOM in water remains a huge challenge for water supplying companies and municipalities responsible for its distribution. The greatest drawback is that the character and composition of NOM in South Africa is not clearly understood, thus resulting in an inefficient treatment process for its removal. This project thus presents an evaluation of NOM in dams, water distribution channels as well as water treatment plants to monitor the occurrence of NOM and develop an effective rapid NOM characterization and removal protocol by treatment plants.	2

9.2.2 Research focus areas of individual study leaders

Name of supervisor	**Brief Description of research focus area**	**No. of available positions for 2016 for students registering for the generic PhD**
Prof Bhekie B Mamba	Professor Bhekie Mamba is the Director of the Nanotechnology and Water sustainability Research Unit and his general research interests is developing advanced technologies for water treatment which include nanotechnology and membrane technology. The main interest is the removal of organic micro pollutants in water and	4

	improving the efficiency of conventional technologies in dealing with new emerging pollutants through integrating existing technologies with nanotechnology. Professor Mamba has supervised to completion over 60 Masters and doctoral students and has published at least 180 papers in peer-reviewed journals. Besides his established international collaborative research network with other esteemed universities locally and abroad, Prof Mamba has presented his research work in several local and international conferences. Prof Mamba's passion is a creating sustainable solution that would ensure that the water resources are maintained and preserved for future generations.	
Prof Titus AM Msagati	Prof Msagati is a specialist in method development for the determination of organic and inorganic pollutants. His work also involves: - Aspects of sampling and sample preparation methods, separation and detection of PoPs, emerging micropollutants (nano pesticides, microplastics, etc.), inorganics (nano materials). - Toxicology, fate and distribution of pollutants: Harmful algae secondary metabolites, toxicity of nano materials, toxic secondary metabolites from microorganisms, etc. -Instrumental methods of analysis: chromatography, hyphenated techniques -Bioremediation of micropollutants – fabrication and use of natural adsorbents (plant extracts, organic wastes, etc.) for the decontamination of	5

	polluted aquatic environment (defluoridation, oil remediation spills)	
Dr Thabo T Nkambule	Dr Nkambule's research interests are in drinking and waste water treatment. This involves studying organic pollutants and developing methods for their efficient removal throughout the urban water cycle. His focus is specifically on Natural Organic Matter (NOM) in South African waters, studying its characterization, treatability and method development for effective NOM removal from water. His research also focuses on studying the influence of the size and polarity of NOM on its removal by adsorption and membrane filtration as well as to understand the behavior of the various NOM fractions in drinking water process by modeling. NOM is a highly variable mixture of products found in various types of water and soils, formed as a result of decomposition of plant and animal material into water.	1
Prof Ajay Mishra	Prof Ajay Mishra's research interest falls under the broad area of Nanomaterials where he is more focussed on fabricating new composite/nanocomposite materials. These materials are widely used in the treatment of water. He supervises students involved in the water treatment research in projects involving heavy metal removal and degradation of various dyes. His research focuses aims at developing a protocol which may lead to developing a technology which may be utilized for industrial	2

	purposes.	
Prof Sabelo D Mhlanga	Prof Mhlanga's research interests involve the development of energy efficient water purification systems using nanotechnology. His approach is to use green chemical strategies to synthesize the various nanomaterials for drinking and wastewater purification including carbon based nano materials, polymeric and polymer-ceramic mixed matrix membrane filtration materials, novel nano adsorbents. Prof Mhlanga has keen interest in providing water purification and supply solutions for rural communities. Some of the nanomaterials he has produced are used for other applications in areas of catalysis and energy through collaborative projects.	3
Prof Edward Nxumalo	Prof Nxumalo's research delves on carbon-based membranes: fabrication, analysis and application (desalination, nanofiltration, *etc*.). The technique uses facile procedures and involves techniques such as phase inversion, interfacial polymerization and electro-spinning. He also has interests on the synthesis and advanced characterization of heteroatomic and doped carbons and the catalytic application of organometallic complexes in the production of nanomaterials e.g. substituted ferrocenes.	3

9.2.3 Modes of supervision in NanoWS

Supervised or co-supervised. On-campus presence in laboratories would be required.

9.2.4 Opportunities for external supervision in NanoWS

External experts in the field of nanotechnology and/or water research will be invited to act as co-supervisors to selected projects, especially if their contribution is expected to be above that of a collaborator. Any external co-supervisor will be identified by the project leader and recommended by NanoWS directorate prior to approval by the University.
Similarly researchers in NanoWS may act as co-supervisors for projects in other institutions where they hold expertise.

9.2.5 Contact details for NanoWS

Entity	Name	Designation	Telephone	e-mail
NanoWS	Prof Bhekie B Mamba	Director	011 670 9840	mambabb@unisa.ac.za

9.3 Projected 2016 supervisory capacity: School of Engineering

The Department of Civil and Chemical Engineering can take about 10 PhD candidates in 2016 in the following generic research areas:

- Energy, Energy conservation, Energy conversion
- Materials for energy production and conversion
- Synthetic fuels, including biomass derived fuels
- Nanomaterials, Fuel cells
- Natural gas conversion

9.3.1 Specific projects that students can participate in:

Project Leader	Name of project	Brief Description of the project	No. of available positions for 2016 for students registering for

			the generic PhD
Prof C Masuku	Catalysis	Photocatalytic production of hydrogen using TiO_2 supported catalysts. In collaboration with Prof Mauro Celso Ribeiro, Associate Professor of Chemistry at Universidade Federal Fluminense – Volta Redonda, Rio de Janeiro, Brazil. Potential student has already been identified	1
Dr G Danha	Minerals Processing	Optimization of comminution, leaching, flotation or integrated processes in the beneficiation of low grade mineral ores e.g. PGMs, gold, base metals, etc. In collaboration with Prof Francois Mulenga.	2
Prof T Mokrani	• Nanocomposite membranes development for fuel cell applications • Gas Conversion	• Organic / Inorganic nanocomposite proton conductor membranes will be developed, to enhance the characteristics of the pristine polymer. The inorganic materials include the metal oxides, zirconium phosphate, different clays , different zeolites, and heteropolyacids. For the organic proton conductor, we are looking for conventional Nafion, also we are developing new type of polymeric materials. • This project included heterogeneous catalysts for gas conversion, namely, methanol synthesis, DME synthesis, Methanol reforming to hydrogen, DME reforming to hydrogen, methanol to olefins and COD process.	4
Prof B Patel	Process synthesis and modelling	Process synthesis and modelling Biomass conversion to fuel and products	2

Prof M Scurrell	Catalysis	Heterogeneous catalysts prepared by advanced radiation or plasma methods for energy conversion and their characterization using advanced spectroscopies.	2
Prof L Jewell	Catalysis		

9.3.2 Research focus areas of individual study leaders

Name of supervisor	Brief Description of research focus area	No. of available positions for 2016 for students registering for the generic PhD
Prof C Masuku	Fischer-Tropsch, Catalysis	
Dr G Danha	Mineral processing	2
Prof T Mokrani	• Nanocomposite membranes development for fuel cell applications • Gas Conversion • Membrane technology for water treatment • Nanotubes and nanofibers development	4
Prof B Patel	Process synthesis and modelling	
Prof M Scurrell	Catalysis	2
Prof L Jewell	Catalysis	

The Department of Electrical and Mining Engineering can potentially admit PhD candidates in 2016 in the following generic research areas:

- Computational Modelling
- Integrated Comminution
- Control Theory and Control Engineering

9.3.3 Specific projects that students can participate in:

Project Leader	Name of project	Brief Description of the project	No. of available

			positions for 2016 for students registering for the generic PhD
Prof Francois Mulenga	Minerals Processing	Simulation of blasting, crushing and milling using discrete element method, computational fluid dynamics and phenomenological models	2
Prof Zenghui Wang	Control and Automation	Automation: it includes two parts: Control Theory and Control Engineering. Control theory is a branch of engineering and mathematics that deals with the behavior of dynamical systems. Control engineering or control systems engineering is the engineering discipline that applies control theory to design systems such as chemical process, manufacturing process, power system, mining process, domotics, robotics, astronautics and aeronautics. Moreover, there is another topic called 'intelligent control' which also belongs to Control Theory and Control Engineering and is a class of control techniques, which use various artificial intelligent computing approaches like neural networks, fuzzy logic, machine learning, evolutionary computation and genetic algorithms.	2
Prof Lukas Snyman	Superconductivity, Photonics		

9.3.4 Research focus areas of individual study leaders

Name of supervisor	**Brief Description of research focus area**	**No. of available positions for 2016 for students registering for the generic PhD**
Prof Francois Mulenga	Minerals Processing	2

Prof Zenghui Wang	Control and Automation	2
Prof Lukas Snyman	Superconductivity, Photonics	

The Department of Mechanical and Industrial Engineering can potentially admit candidates in 2016 in the following generic research areas:

- Operations and quality management
- Alternative and renewable energy
- Biomechanics and bio-mimicry
- Entrepreneurship
- Lean manufacturing techniques and philosophy

9.3.5 Specific projects that students can participate in:

Project Leader	Name of project	Brief Description of the project	No. of available positions for 2016 for students registering for the generic PhD
Prof V Vasudevarao	• Two Phase Flows • Thermal Contact Conductance • Nano-Thermal Interface Materials • Nano-Thermo-Fluids and Compact Heat Exchangers • Cooling of Electronics • Jet impingement Cooling • Thermo-physical Properties of Advanced Materials	• Studies on the Two Phase flow in a nuclear reactor are very important due to safety requirements. Experimental data on such studies is very critical to design and safe operation. This project is aimed at simulating the two phase flow conditions in a laboratory scale set-up and collect s valuable data. • Thermal contact conductance is often neglected in the design of mechanical, Chemical, Nuclear equipment. Even if it is considered, it is either over estimated or under estimated. This project deals with accurate measurement of Thermal	12

	• Combined studies of Electrical and Thermal Contact	contact conductance. • Nano-Thermal interface materials are new class of material used in the thermal control of advanced electronics. Intelligent use of these materials ensures reliability of expensive devices and equipment. This project is focused on the development and testing of these materials. • Nano-Thermo-Fluids are now finding applications in transportation industry. Development and their applications in Compact heat exchanger results in large energy savings. The objective of this project is to develop and test these fluids for their effective usage in transportation industry. • This project deals with thermal management of advanced electronics where there is large heat generation in a small volume. • Jet impingement is an effective method of cooling in manufacturing industry where there is large amount of heat to be removed. Jet impingement is also being used in microelectronics. The objective of this project is to investigate the geometric parameters on the cooling effectiveness. • Every day new material are being developed and added to the list of advanced materials. Knowledge of the thermo-physical properties is very important to put them in the right application such as in high-	

		performance applications	
Prof Wei Hua Ho	• Small scale wind turbine design and analysis using bio-inspired airfoil shapes. • Optimisation of bio-inspired airfoil shapes for improved lift and drag characteristics for micro air vehicles. • Various applications of Organic Rankine Cycles systems	Bio-inspired airfoil shapes have shown improved performance particularly at low Re. This project seeks to incorporate and optimize such shapes into small scale wind turbine designs. This project seeks to investigate and optimize bio-inspired airfoil shapes for use on micro air vehicles. Conventional power generation systems, such as a steam-based Rankine cycle, require a substantial energy input and have a relatively low efficiency, typically less than 50%. Current ecological requirements demand more nature-friendly solutions, with lower CO2 emissions, and more efficient use of the supplied energy. Hybrid power systems integrate renewable energy technologies with some other forms of energy sources to provide power with improved efficiency. Conventional Rankine cycles can operate at significantly lower temperatures if a suitable organic compound is chosen as a working fluid. Lower working temperatures allow solar energy sources to be utilised. Optimisation of the solar powered organic Rankine cycle will be carried out through mathematical modelling. The suitability of working fluids to be paired with solar energy source will be investigated and parametric optimisation of the system will validate	3

		efficient and sustainable solutions.	
Prof Chris Enweremadu	• Solar thermal collectors • Concentrated solar thermal applications • Applications of Solar Organic Rankine Cycle • Alternative fuel research	Design, mathematical modelling, simulation and analysis of solar thermal collectors with sensible thermal storage system. Design, modelling, simulation, techno-economic analysis and efficiency of the system. Development of sensible thermal storage hybrid rock bed material for Concentrating Solar Thermal (CST) applications. Modelling, simulation, thermal characterisation, techno-economic analysis and efficiency of the system. Solar Organic Rankine Cycle for low grade waste heat recovery – design, development, techno-economic analysis and application in combined heat and power systems. Engine performance, combustion and emission characteristics of various types of green fuels	4
Prof David Johannes Kruger	• Process Optimisation • Systems Thinking • Systems Improvement • Process development • Complex Theory • Lean Manufacturing/ Production • Lean Six Sigma • Process Quality • Engineering Management	Lean Project Management for all engineering disciplines. Developing lean processes for chemical plants. Lean implementation in the supply of electricity. Lean in mining to reduce production cost and improve productivity.	6

	• Lean Supply Chains • Lean Project Management		
Dr K Ramdass	Operations management Quality management Industrial Engineering	The research areas deal with the optimization of complex processes or systems. It is concerned with the development, improvement, and implementation of integrated systems of people, money, knowledge, information, equipment, energy, materials, analysis and synthesis, as well as the mathematical, physical and social sciences together with the principles and methods of engineering design to specify, predict, and evaluate the results to be obtained from such systems or processes.	5
Dr Harry Ngwangwa	• Condition monitoring of gearing and ball-bearing systems using advanced signal processing and artificial intelligence methods • Development of battery charging system by harvesting mechanical vibratory energy. Vibration control in machine tools for quality improvement	Gears and ball-bearings are very important load transmission and bearing parts in most rotating machinery. It is therefore almost inevitable that they wear out during operation. There is therefore a growing concern throughout industry to monitor their condition so that remedial action can be put in place before any catastrophic failure which may result in economic and human life loss or injury. This project seeks to develop methodologies for condition monitoring of gearing and bearing systems.	2
Dr Rendani Maladzhi	• Motivation • Small and Medium Enterprise operations Entrepreneurship		2
Dr F Masithulela	• Computational modeling of infarcted tissue in	Finite element modeling of healthy and diseased and soft tissue is to be undertaken using the experimental data acquired via real	8

	remodeling heart • Mechanical testing and mathematical modeling of liver tissue • Mechano-biology of soft tissue • Design of accurate shoulder implants suitable for variety of individuals	soft tissue geometries. Experimental analysis of healthy soft and diseased tissue is to be carried out in order to achieve the accuracy of tissue mechanics. Cell mechanics of healthy and infarcted tissue. The study bone behaviour is achieved by utilizing experimental data. The experimental data is then used to general computational models with the aim of designing the accurate shoulder Implants suitable for various shoulder shapes. These projects should be interesting to those students who are both hands-on oriented.	

9.3.6 Research focus areas of individual study leaders

Name of supervisor	Brief Description of research focus area	No. of available positions for 2016 for students registering for the generic PhD
Prof V Vasudevarao	• Two Phase Flows • Thermal Contact Conductance • Nano-Thermal Interface Materials • Nano-Thermo-Fluids and Compact Heat Exchangers • Cooling of Electronics • Jet impingement Cooling • Thermo-physical Properties of Advanced Materials Combined studies of Electrical and Thermal Contact	12
Prof Wei Hua Ho	• Gas Turbine and Test Cell design and analysis • Aerodynamics of bio-inspired structures • CFD of combustion and gasification processes • Fluid analysis of bio-systems • Waste heat recovery using organic rankine	3

	cycle • Wind turbine design and analysis	
Prof Chris Enweremadu	• Alternative fuels & Combustion • Renewable energy • Energy systems • Energy conservation and efficiency	4
Prof David Kruger	• Process Optimisation • Systems Thinking • Systems Improvement • Process development • Complex Theory • Lean Manufacturing/ Production • Lean Six Sigma • Process Quality • Engineering Management • Lean Supply Chains • Lean Project Management	8
Dr K Ramdass	• Operations management • Quality management • Industrial Engineering	5
Dr Harry Ngwangwa	**Structural dynamics:** Linear and nonlinear vibrations, dynamics, noise and acoustics, mechanics of manufacturing processes, finite element modelling, experimental model identification for mechanical systems, structural health monitoring of mechanical systems, inverse modelling and artificial intelligence methods and development of mechanical energy harvesting devices.	2
Dr Rendani Maladzhi	• Motivation • Small and Medium Enterprise operations • Entrepreneurship	2
Dr F Masithulela	Computational biomechanics, mechano-biology, mathematical modelling, computational mechanics,	8

	finite element modelling, Soft tissue testing and modelling	

9.3.7 Modes of supervision in School of Engineering

The current mode of supervision in the School of Engineering is on the basis of group supervision where co-supervisors are appointed.

9.3.8 Opportunities for external supervision in School of Engineering

No current opportunities exist.

9.3.9 Contact details for School of Engineering

Entity	Name	Designation	Telephone	e-mail
SoE	Ms Susan De Klerk	Secretary to the Director, SoE	0116702299	SDeklerk@unisa.ac.za

9.4 Projected 2016 supervisory capacity: Institute for Science and Technology Education

The Institute for Science and Technology Education has capacity for PhD candidates in 2016 in the following research areas:

9.4.1 Research focus areas of individual study leaders

Name of supervisor	Brief Description of research focus area	No. of available positions for 2016 for students registering for the generic PhD
Prof Jeanne Kriek	Physics Education: Use of technology in the teaching and learning of physics; conceptual understanding of physics concepts; effective use of simulations in physics	3
Prof Nosisi N Feza	Developing researched based models for teaching mathematics concepts across all school levels and beyond.	15

Prof Keshnee Padayachee	Collaborative e-learning; Open, distance and e-learning (ODeL); Information Security	3
Dr Chukunoye Enunuwe Ochonogor	Evolving effective pedagogical approaches for the teaching and learning Chemistry and Science concepts including Chemistry problem-solving at all school levels.	2

9.4.2 Modes of supervision in the Institute for Science and Technology Education

The current mode of supervision in the Institute for Science and Technology Education entails one-on-one supervision. Where desirable a co-supervisor may also be appointed.

9.4.3 Opportunities for external supervision

Currently no new opportunities for external supervision are available for 2016.

9.4.4 Contact details for the Institute of Science and Technology Education

Entitity	Name	Telephone	e-mail
Institute for Science and Technology Education	Prof Feza (Head of Institute)	012-337-6168	fezann@unisa.ac.za

10. TYPE 2 INFORMATION (HOW TO PARTICIPATE)

10.1 Type 2 Information on admission requirements for generic doctoral applications in CSET

10.1.1 Minimum generic requirements

The following minimum generic requirements are applicable to all applicants for doctoral degrees in CSET:

- All students applying have to be in possession of an appropriate master's degree or equivalent 96 credits NQF level 9 qualification (new NQF levels) in the discipline that the applicant wishes to do a master's degree in. The average mark obtained for the master's degree shall be 60%.
- All applicants must engage with the relevant academic department or institute and discuss their intended proposed field of specialization and study focus area with academic staff members of the relevant department. The contact people (and first point of entry for all applicants) are the names of the persons supplied in Section 3 of this document. No person will be admitted without record of such an engagement with the relevant department.
- All applicants must have a suitable topic (following from the discussions under (1)) prior to admission.
- An applicant may only apply for admission if the name of a suitable supervisor has been provided by the relevant academic department. The name of the appropriate supervisor will be determined on the basis of areas of expertise/interest and available supervisory capacity of the academic members of staff in the department. Available supervisory capacity will be determined on the basis of the existing approved CSET supervisory capacity guidelines. No applicant will be admitted without a supervisor.
- All students need to demonstrate adequate mastery of English as academic language. In this regard students will have to provide evidence of TOEFL (A minimum score of 88 for the Internet-based test or a minimum score of 570 for the paper-based test is required). Exceptions will apply for students who have completed their masters degrees at a university where English is the prime language of instruction. Other exceptions may be considered and approved by the COD or the Director of the Institute on an individual basis.
- All students should have had adequate exposure to appropriate research methods and methodologies as part of their previous qualifications.
- Students who need to do laboratory work as part of their studies will be subject to residency requirements.
- Foreign students will be requested to submit a SAQA evaluation of their qualifications. The evaluation has to indicate that the degree is the equivalent of a South African degree at NQF level 9 (new NQF levels). An academic department may grant an applicant an exemption from this if the student's qualification has been previously accredited and deemed acceptable by Unisa.
- In all instances where a student has been refused admission such instances and the reasons for refusal of admission will be submitted to the College Executive Committee for final approval of the decision. Candidates who have been refused may approach the Chair of Department or the Director of the Institute for the reasons of refusal.

In instances where entry to the generic PhD in a particular project or focus area is competitive, selection will be based on the following process (with due regard to redress of past inequalities in the South African educational system):

- Only candidates who meet the minimum eligibility criteria will be considered
- Each candidate will be requested to provide a three-page document that needs to provide evidence and arguments on the following: (1)Reasons for wanting to do the qualification and for selecting the specific study area that is being applied for; (2) A proposal on how the applicant intends approaching the studies in order to complete this within the prescribed period of time allowed for the qualification; (3) Commitment to the discipline and the focus area outside of the proposed qualification being applied for; (4) Fundamental understanding of, and experience in appropriate research methods and techniques; (5) Capacity for sustained hard work and academic activity over an extended period of time.
- These documents will be evaluated on the following basis (weight attached to each criterion is indicated in brackets as a percentage of overall evaluation): (1) Appropriateness of reasons for applying to do the qualification in the indicated study area (15%); (2) Quality and coherence of the reasoning and language use in the document (in English) (30%); (3) Evidence of commitment to the specialist area outside of the proposed qualification (20%); (4) Evidence of the capacity for sustained hard work and academic activity over an extended period of time (15%); (5) Experience in and understanding of research methods as part of previous qualifications (20%).
- Where any aspect of an application is unclear to the academic department or institute, the institutional representative(s) tasked with evaluating the applications may request an interview with the applicant.
- The results of the competitive process will be submitted to a departmental/institutional committee authorized to approve the results, and unsuccessful applicants may apply for the reasons for rejection of their applications. Unsuccessful applicants have the right to appeal using the appropriate Unisa channels and procedures.

10.1.2 Additional minimum requirements for specific departments or institutes:

In addition to the CSET minimum generic requirements the following specific additional minimum requirements are valid for specific academic departments:

MaPS

Material and Process Synthesis is a multidisciplinary field (one that has applications in engineering, chemistry, biology, physics, etc.) and while the focus of MaPS is around energy efficiency, the research unit shall admit doctoral candidates with various backgrounds in science, engineering and technology fields provided that they are deemed to possess adequate experience to conduct a specific project within the research unit. The unit shall admit prospective students for doctoral degrees provided that they have satisfied all the admission requirements for a master's or doctoral degree in the science, engineering and technology fields of study.

Each postgraduate candidate shall work closely with a supervisor (staff member in MaPS) on a chosen research project. Research projects may be experimental, theoretical, or a combination thereof, depending on the student and supervisor's interests and expertise. Some research projects may require collaboration and co-supervision with other researchers within CSET, researchers and professors from other universities, locally and internationally, scientists from national laboratories and research centres (such as Mintek and the CSIR), postdoctoral research fellows, and other graduate students.
Collaboration shall be encouraged for projects with multidisciplinary aspects. As such, an applicant who holds an MSc or MTech degree in chemical engineering, mathematics, computer science, chemistry, chemical technology, nanoscience, biology, biotechnology, materials science, physics, environmental engineering, and environmental sciences, for example, shall be admitted into the PhD programme provided that they have the skills to model and optimize processes. All postgraduate programmes within the unit shall be by dissertation or thesis only (i.e. no coursework).
In addition to the admission requirements in section 4.1.1, the internal selection committee within MaPS will further apply the following specific selection criteria in the admission process:

1. Availability of laboratory space.
2. Proposed research projects must be within the selected themes of the MaPS research unit.

NanoWS

Since Nanotechnology is a multidisciplinary field (one that has applications in engineering, chemistry, biology, physics, medicine, etc.) and while the focus of the NanoWS research unit is to develop nanotechnologies in order to solve various water related problems, the research unit shall admit doctoral candidates with various backgrounds in science, engineering and technology fields provided that they are deemed to possess adequate experience to conduct a specific project within the research unit. The unit shall admit prospective students for doctoral degrees provided that they have satisfied all the admission requirements for a doctoral degree in the science, engineering and technology fields of study.

Each postgraduate candidate shall work closely with a supervisor (permanent staff member in NanoWS research unit) on a chosen research project. Research projects may be experimental, theoretical, or a combination thereof, depending on the student and supervisor's interests and expertise. Some research projects may require collaboration and co-supervision with other researchers within CSET, researchers and professors from other universities, locally and internationally, scientists from national laboratories and research centres (such as Mintek and the CSIR), postdoctoral research fellows, and other graduate students. Collaboration shall be encouraged for projects with multidisciplinary aspects. As such, an applicant who holds an MSc or MTech degree in chemistry, chemical technology, nanoscience, biology, biotechnology, materials science, physics environmental engineering, and environmental sciences, for example, shall be admitted into the PhD programme provided that they have previously carried out research on nanotechnology for water, nanomaterials synthesis and applications, water science and/or engineering related projects in their previous qualification/s. All postgraduate programmes within the unit shall be by dissertation or thesis only (i.e. no coursework).
In addition to the admission requirements in section 4.1.1, the internal selection committee within the NanoWS research unit will further apply the following specific selection criteria in the admission process:

1. Availability of laboratory space.
2. Proposed research projects must be within the selected themes of the NanoWS research unit.

10.1.3. Supporting documentation required to accompany all applications for admission

10.1.3.1 Supporting documentation required for all applications in CSET

The following documentation should accompany all applications for doctoral qualifications in CSET:

- A certified copy of an identity document/passport
- Certified transcripts of academic records of previous qualifications obtained
- Proof of qualification (Certified copies of certificates of previous qualifications)
- A letter from the academic department or institute in CSET where the applicant wishes to study confirming the field of study and the name of the allocated supervisor
- Proof of TOEFL language proficiency results, or letter from Unisa stating that the applicant has been exempted
- Applicants may be requested to supply detailed syllabi descriptions of their previous qualifications as additional supporting documentation.
- In the instance of competitive entry, a three-page document compiled in accordance with specifications set out in Section 4.1.1 above has to be submitted by the applicant.

10.1.3.2 Additional supporting documentation required to accompany applications for admission for specific departments in CSET

MaPS

Potential Candidates may be requested to write a report critically evaluating a research paper published in the literature.

NanoWS

None.

School of Engineering

Potential Candidates may be requested to write a report critically evaluating a research paper published in the literature

School of Engineering

Engineering is a multidisciplinary and interdisciplinary field (one which draws knowledge from chemistry, physics, mathematics, computer science, environmental science and even economics and management). Each postgraduate student will be required to conduct research in both technical and nontechnical study areas. The program will establish the engineering principles needed by the candidates to develop, implement, and utilize continuous improvement and related methodologies with a focus on the dual considerations of efficiency and waste reduction in processes; in sustainable energy technologies with focus on the dual considerations of energy efficiency and environmental responsibility; in developing lean processes for chemical plants, electricity supply, mining, agriculture and forestry, waste management, etc. Research areas include energy management and auditing, energy

cost/benefit analysis, Payback and Life Cycle Costing of energy efficiency/conservation measures, lean management and implementation, environmental studies and climate change, etc.
Each postgraduate candidate shall work closely with a supervisor (permanent staff member in School of Engineering) on a chosen research project. Research projects may be experimental, theoretical (simulation & modelling), or a combination thereof, depending on the student and supervisor's interests and expertise. Some research projects may require collaboration and co-supervision with other researchers within CSET, researchers and professors from other universities, locally and internationally, scientists from national laboratories and research centres (such as iThemba Labs, MINTEK and the CSIR), postdoctoral research fellows, and other graduate students. Collaboration shall be encouraged for projects with multidisciplinary aspects. As such, an applicant who holds an MSc or MTech degree in mechanical engineering, energy engineering, industrial engineering, electrical engineering, mining engineering, chemical engineering, mathematics, computer science, chemistry, chemical technology, nanoscience, biotechnology, materials science, physics, environmental engineering, and environmental sciences, for example, shall be admitted into the PhD programme provided that they have the skills to model and optimize processes; have previously carried out research on engineering related projects in their previous qualification/s. All postgraduate programmes within the School shall be by thesis only.
In addition to the admission requirements in section 4.1.1, the internal selection committee within the School of Engineering will further apply the following specific selection criteria in the admission process:

1. Availability of laboratory space.
2. Proposed research projects must be within the selected themes of the School of Engineering.

10.2 Possible alternative opportunities for unsuccessful candidates

The names of unsuccessful candidates and the reasons for their rejection will be submitted to the College Executive Committee for validation. All unsuccessful candidates may apply for written reasons for their rejection which shall be supplied in writing by the Chair of the Department of the relevant department.
The following possible alternative opportunities exist for applicants who do not meet the generic admission requirements for CSET:

10.2.1 Generic alternative opportunities for CSET

- Applicants with degrees that have different structures from normal South African masters degrees, applicants whose degrees do not clearly correspond to generic CSET admissions requirements (e.g. no mark awarded for previous dissertations, no clear evidence of having completed a research-related module as part of the previous qualification, etc.), or applicants who do not meet generic admissions requirements but who possess applicable experience in research that may qualify them for admissions to a PhD degree will be required to apply for Recognition of Prior Learning (RPL). Prior academic and research activity by the applicant will be evaluated in accordance with formal Unisa RPL procedures and the outcome of the RPL process will be submitted to and approved by the College Executive Committee. If the approved outcome of the RPL process is positive, the applicant will be allowed to proceed with an application for admission, subject to all terms and conditions governing the admissions process.

- Students who have been refused admission because of limited capacity within the academic department where the application was made may reapply in subsequent years.

10.2.2 Additional possible alternative opportunities for unsuccessful candidates in specific academic departments in CSET

MaPS
None.

NanoWS
None.

Engineering
None.

11. Type 3 information: When to apply

CSET has dual application streams:
For all departments/institutes offering the generic PhD in CSET (School of Science and School of Engineering) a continuous applications and admissions process will apply, because of the scarcity of applicants in these research focus areas. Applicants will therefore be allowed to commence with their applications throughout the year, provided that supervisory capacity is available in the area of specialization that the applicant wishes to apply for.