ELECTRONIC & COMPUTER ENGINEERING

2022
HANDBOOK

DUT
DURBAN UNIVERSITY OF TECHNOLOGY
INYUVESI YASETHEKWINI KWEZOBUCHWEPHESHE

FACULTY OF ENGINEERING & THE BUILT ENVIRONMENT

HANDBOOK FOR 2022

FACULTY of ENGINEERING AND THE BUILT ENVIRONMENT

DEPARTMENT of ELECTRONIC AND COMPUTER ENGINEERING

December 09, 2021, Version 2.0

DEPARTMENTAL VISION AND MISSION STATEMENT

VISION

To be known for excellence in producing electronic and computer engineering professionals who use engineering and technology for societal development in South Africa.

MISSION

- To produce socially responsible graduates attuned to the needs of industry, the environment and the community.
- To ensure that teaching and learning follow best practice.
- To engage in research and development activities that are responsive to national and international challenges in clearly defined areas of strength.

UNIVERSITY OF TECHNOLOGY

The objective of a University of Technology such as DUT is "to create, apply and transfer knowledge and technology of an international standard through cooperative and professional career education programmes."

- Committee of Technikon Principals (CTP) (2004), Universities of Technology in South Africa

DUT, which is a leading institute of higher learning within the Kwa-Zulu Natal (KZN) region, is committed to providing quality and current education, within the technology sector, to successful prospective learners. The university's vision captures this with the simple phrase that reads "A preferred university for developing leadership in technology and productive citizenship."

The qualifications on offer within the Department of Electronic and Computer Engineering have been developed to achieve the long-term strategic objectives of DUT; namely:

1. A teaching and learning environment that values and supports the university community;
2. Promoting excellence in learning and teaching, technology transfer and applied research; and
3. External engagement that promotes innovation and entrepreneurship through collaboration and partnership.

Moreover, the qualifications have been designed and structured to encourage graduates to be:

1. Socially relevant;
2. Professionally career orientated;
3. Exposed to a technologically relevant environment to ensure technological excellence; and
4. Able to carry out the notion of "lifelong learning".

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IMPORTANT NOTICE

The departmental rules in this handbook must be read in conjunction with the Durban University of Technology's General Rules contained in the current General Handbook for Students.

NOTE TO ALL REGISTERED STUDENTS

Your registration is in accordance with all current rules of the Institution. If, for whatever reason, you do not register consecutively for every year/semester of your programme, your existing registration contract with the Institution will cease. Your re-registration anytime thereafter will be at the discretion of the Institution and, if permitted, will be in accordance with the rules applicable at that time.

GENERAL DEPARTMENT AND FACULTY INFORMATION

Department of Electronic and Computer Engineering, DUT
Block S8, Level 3, Steve Biko Campus, Steve Biko Road, Durban 4001.
Postal Address: PO Box 1334 Durban, KwaZulu-Natal, RSA. 4000

Website: https://www.dut.ac.za/faculty/engineering/electronic_engineering/

Acting Head of Department Mr K Moorgas

All Departmental queries to:

Secretary	Mrs Premi Chetty
Telephone	031-373 2932
Fax	031-373 2744
Email	premi@dut.ac.za

All Faculty queries to:

Faculty Officer	Mrs N Singh
Telephone	031-373 2718
Fax	031-373 2719

Location of Faculty Office: Steve Biko Campus, S4 Level 3

Executive Dean	Prof B Twala
Dean's Secretary	Ms P Nadar
Telephone	031-373 2762
Fax	031-373 2724
Location of Executive Dean's Office:	Steve Biko Campus, S6 Level 5

Central Applications Office (CAO)
Private Bag X06, Dalbridge 4014. Tel: 031-2684444, website: www.cao.ac.za

Engineering Council of South Africa (ECSA)
Private Bag X691, Bruma, 2026. Tel: 011-6079500, Fax: 011-6229295
Email: engineer@ecsa.co.za, website: www.ecsa.co.za

South African Institute of Measurement and Control
Tel. /Fax: 011-888 8332
Email: ctr@SAIMC.org.za, website: www.saimc.org.za

South African Institute of Electrical Engineers (SAIEE)
Secretary: Ms Gill Nortier, PO Box 22222, Glenashley, 4022.
Tel/fax: 031-5725838
Email: saiee@africa.com, website: www.saiee.org.za

South African Qualifications Authority (SAQA)
Postnet Suite 248, Private Bag X06, Waterkloof, 0145.
Tel: 012-4315000 Fax: 012-4315039, website: www.saqa.org.za

DEPARTMENTAL STAFF

Acting HOD:	Mr K E Moorgas; NDip (MLST), BTech (DIT), MTech (DUT); MSAIEE, Pr.Techni.Eng (ECSA)
Associate Professor:	Prof B Nleya; MSc, Ph.D (SUT, St. Petersburg); SMIEEE, SMIEICE, Pr.Eng (ECSA)
Senior Lecturers:	Mr A Moolla; NHD (PSE), (MLST), MDipTech (MLST) Mr B Saligram; MDipTech (MLST) Dr N Singh; BSc(Eng) (UN), MSc(Eng) (UN), MBA (UN), Ph.D (UKZN); Pr.Eng (ECSA)
Lecturers:	Mr S Maharaj; NDip (DUT), BTech (DUT), M.Eng (DUT) Mrs A Pillay; NDip (TN), BTech (DIT), MTech (DUT) Dr N Pillay; NDip (MLS), BTech (DIT), MTech (DUT), DEng (DUT); Pr.Tech.Eng (ECSA) Mr R Sewsunker; BSc(Eng) (UKZN), MSc(Eng) (UKZN), MSc(E Eng) (WSU, USA); SAIEE, ECSA Ms N Shezi; NDip (DUT), BTech (DUT), MEng (DUT)
Senior Technicians:	Mr B Doorsamy; BTech (TUT) Mr I Haniff; BSc(Eng)(UKZN); SMSAIEE Mr P Morris; NDip (TN), BTech (DUT)
Technicians:	Mr P Hendry; NDip (MLST) Mr A Jooravan; NDip (DIT), BTech (DUT), MBA(UKZN) Mr B Mgobhozi; NDip (DUT), BTech (DUT) Mr MM Molefe; BTech (DUT)
Senior Technical Assistant:	Mr N Rupnarain
Technical Assistant:	Ms T Makhanya; BTech (DUT)
Secretary:	Mrs D Chetty; NHD (MLST)

INSTRUCTIONAL PROGRAMMES OFFERED BY THE DEPARTMENT

Programmes are offered in this Department which, upon successful completion, lead to the award of the following qualifications:

HEQSF Qualification	Qualification Code	SAQA NLRD Number
Bachelor of Engineering Technology in Electronic Engineering	BNELC1	99514
Master of Engineering (MEng)	MNELC1	96827
Doctor of Engineering (DEng)	DNELC1	96812

BACHELOR OF ENGINEERING TECHNOLOGY IN ELECTRONIC ENGINEERING [BEngTech (Electronic Engineering)]

BE1 GENERAL INFORMATION

The undergraduate programme in electronic engineering, which leads to the internationally accredited BEngTech degree, is designed to provide a broad foundation in electronic and computer engineering through a combination of classroom and/or online lectures, extensive hands-on technical training, laboratory work as well as software, simulation, and online tools. The qualification prepares the student for a career in a variety of electronic and computer engineering fields as well as becoming a competent practising engineering technologist or certificated engineer that will make a meaningful contribution to the economy and national development.

The programme will provide the student with a strong foundation in mathematics, physical sciences and the core fundamentals of engineering and blends theory, concept and application. Electronic and computer engineering finds itself at the heart of the burgeoning Industry 4.0 and merges fields such as telecommunications, control systems, embedded and intelligent systems, data analytics and machine intelligence, automation and robotics, signal and image processing, smart factories and cities, green energy, AI and the industrial IoT.

The learning programme leading to this qualification contains 428 credits with a minimum of 120 Credits at NQF level 7. The Credits are distributed to create a coherent progression of learning towards the exit level. This qualification requires a minimum of three years of academic study.

Some of the key attributes of the programme include the fostering of lifelong learners, the need for continuous improvement, teamwork and the attainment of solid critical thinking and problem-solving skills. The BEngTech qualification will also allow for further study through articulation into the postgraduate NQF level 8 BEngTech Honours programme, to be offered in the future at DUT, and the subsequent opportunity for master's and doctoral research.

Qualified candidates may register with the internationally affiliated Engineering Council of South Africa (ECSA) as Professional Engineering Technologists and/or Professional Certified Engineers.

Professional Engineering Technologists are characterized by the ability to apply established and newly developed engineering technology to solve broadly-defined problems, develop components, systems, services and processes. They provide leadership in the application of technology in safety, health, engineering and commercially effective operations and have well-developed interpersonal skills. They work independently and responsibly, applying judgement to decisions arising in the

application of technology and health and safety considerations to problems and associated risks. Moreover, Professional Engineering Technologists have a specialized understanding of engineering sciences underlying a deep knowledge of specific technologies together with financial, commercial, legal, social and economic, health, safety and environmental matters.

Professional Certificated Engineers are characterized by the ability to apply established and newly developed engineering technology to solve broadly defined problems, develop components, systems, services and processes in specific areas where a legal appointment is required in terms of either the Occupational Health and Safety Act, the Mines Health and Safety Act, or the Merchant Shipping Act, e.g. factories, mines and marine environments. They provide leadership in safety, health, engineering and commercially effective operations and have well-developed managerial skills. They work independently and responsibly, applying judgement to decisions arising in the application of technology and health and safety considerations to problems and associated risks. Professional Certificated Engineers have a specialized understanding of engineering sciences underlying manufacturing, marine, mining, plant and operations, together with financial, commercial, legal, socio-economic, health, safety and environmental methodologies, procedures and best practices.

The graduates of this degree will demonstrate evidence, as appropriate to their disciplines, of the following attributes:

1. Basic Proficiency and Competencies, including:
   a. Information literacy
   b. Communication (oral and written)
   c. Numeracy
   d. Technology applications
2. Innovation, including:
   a. Entrepreneurship
   b. Leadership
3. Social Responsibility, including:
   a. Ethics
   b. Diversity
   c. Critical and engaged citizenry embedded in a local and global context
4. Personal Development, including:
   a. Self-awareness
   b. Self-directed and life-long learning
5. Broad understanding of their chosen discipline and/or profession, including:
   a. An appropriate discipline or professional approach to knowledge production
   b. Workplace adaptability

Engineering students completing this qualification will be able to demonstrate competence in 11 Graduate Attributes. The Graduate Attributes are stated generically and may be assessed in various engineering disciplinary or cross-disciplinary contexts in a provider-based or simulated practice environment.

- **Graduate Attribute 1: Problem Solving**
  Students will be required to identify, formulate, analyse and solve broadly defined engineering problems.

- **Graduate Attribute 2: Application of scientific and engineering knowledge**
  Students will apply knowledge of mathematics, natural sciences, engineering fundamentals and an engineering speciality to solve broadly-defined engineering problems.

- **Graduate Attribute 3: Engineering Design**
  Students will perform creative, procedural and non-procedural design and synthesis of components, systems, engineering works, products or processes.

- **Graduate Attribute 4: Investigation, experiments and data analysis**
  Students will demonstrate competence in designing and conducting investigations and experiments.

- **Graduate Attribute 5: Engineering methods, skills, tools, including Information technology**
  Students will demonstrate competence to use appropriate engineering methods, skills and tools, including those based on information technology.

- **Graduate Attribute 6: Professional and Technical Communication**
  Students will demonstrate competence to communicate effectively, both orally and in writing, with engineering audiences and the community at large.

- **Graduate Attribute 7: Sustainability and Impact of Engineering Activity**
  Students will demonstrate critical awareness of the sustainability and impact of engineering activity on the social, industrial and physical environment.

- **Graduate Attribute 8: Individual, Team and Multidisciplinary Working**
  Students will demonstrate competence to work effectively as an individual, in teams and multidisciplinary environments.

- **Graduate Attribute 9: Independent Learning**
  Students will demonstrate competence to engage in independent learning through well-developed learning skills.

- **Graduate Attribute 10: Engineering Professionalism**
  Students will demonstrate critical awareness of the need to act professionally and ethically and to exercise judgment and take responsibility within their limits of competence.

- **Graduate Attribute 11: Engineering Management**
  Students will demonstrate knowledge and understanding of engineering management principles and economic decision-making.

BE2 MINIMUM ADMISSION REQUIREMENTS

The minimum entry requirement is the National Senior Certificate or the National Certificate (Vocational) with appropriate module combinations and levels of achievement as defined in the *Government Gazette*, Vol. 751, No. 32131 of 11 July 2008, and in the *Government Gazette*, Vol. 533, No. 32743, November 2009. In addition, the minimum admission requirements, rule G7, is stipulated in the General Rules Handbook.

Further to the above, the following are required for admission into BEngTech (Electronic Engineering) programme:

(A) NSC, NCV, SC:

Compulsory Subjects	National Senior Certificate	National Certificate (Vocational)	Senior Certificate	
	Rating	Mark	HG	SG
English	4	60%	E	C
Mathematics	4	70%	E	C
Physical Science	4	70%	E	C
Life Orientation		60%		
		+ 2 Vocational Subjects (70%)		

Note:

(1) The exit certificate of the candidate must qualify the candidate for degree study (Bachelor's Pass) at an institution of higher learning.
(2) The NSC subjects Mathematical Literacy and Technical Mathematics will not be accepted as a substitute for the NSC subject Mathematics.
(3) The NSC subject Technical Science will not be accepted as a substitute for the NSC subject Physical Science.
(4) Applicants will be ranked according to the sum of their scores for Mathematics and Physical Science, subject to a minimum combined score of 120.

(B) OTHER:

Applicants that qualify for degree study (Bachelor's Pass) at an institution of higher learning but do not meet the departmental mathematics and/or physical science requirements, may present the following N4 subjects, for consideration for entry to the BET programme:

- Mathematics and Engineering Science, plus any two of the following:
- Industrial Electronics OR Electronics
- Digital Systems OR Logic Systems
- Electrotechnics

The above subjects must be passed with a minimum of 50% and all in the same sitting. Students will then be considered alongside the NSC students according to the sum of their marks for N4 Mathematics and Engineering Science, subject to a minimum combined score of 120.

Applicants may present a cognate level 6 Diploma for entry into the BET programme; credit transfer may be considered dependent on the content thereof being presented.

Applicants may present a cognate National N Diploma for entry into the BET programme; credit transfer is not possible.

BE3 PROMOTION TO A HIGHER LEVEL/ PROGRESSION RULES

(1) All modules have a minimum pass mark of 50%. Moreover, all modules with a summative practical mark will require a minimum pass mark of 50% for the practical component(s).

(2) A student would not be able to attempt higher-level modules before completing ALL the prerequisite modules or satisfying the 40% exposure condition, where applicable.

(3) In addition to the prerequisite and co-requisite requirements of the individual modules, the student needs to pass all 1st Year modules in order to register for any 3rd Year modules.

(4) The student must successively register every year and the qualification must be completed within five years of registration.

BE4 EXPOSURE RULE

A higher-level module requiring an exposure of a lower-level module implies that a student must have achieved at least 40% in the lower-level module in order to attempt the higher-level module. Even if the student passes the higher-level module, the lower-level module will still have to be **repeated and passed** at the next (concurrent or future) offering.

BE5 UNSATISFACTORY ACADEMIC PROGRESS

(1) Students who do not meet the progression rules listed above, will be regarded as having Unsatisfactory Academic Progress, and will not be permitted to continue with the degree unless an appeal to continue is upheld, (refer to G1(8) for appeals).

(2) In modules where a Graduate Attribute (GA) is assessed, the student would need to achieve a final minimum pass mark of 50% as well as be deemed competent in achieving the GA. **A student that achieves a final minimum pass mark of 50% but fails to achieve the GA would fail the module.**

(3) To progress from one study level to the next, a student would need to accumulate a minimum number of credits as indicated in the table below. Students achieving below the minimum credits would be considered as making unsatisfactory academic progress.

END OF PERIOD	MINIMUM CREDITS	MAXIMUM CREDITS
Year 1 (Semester 2)	74	148
Year 2 (Semester 4)	148	296
Year 3 (Semester 6)	222	428

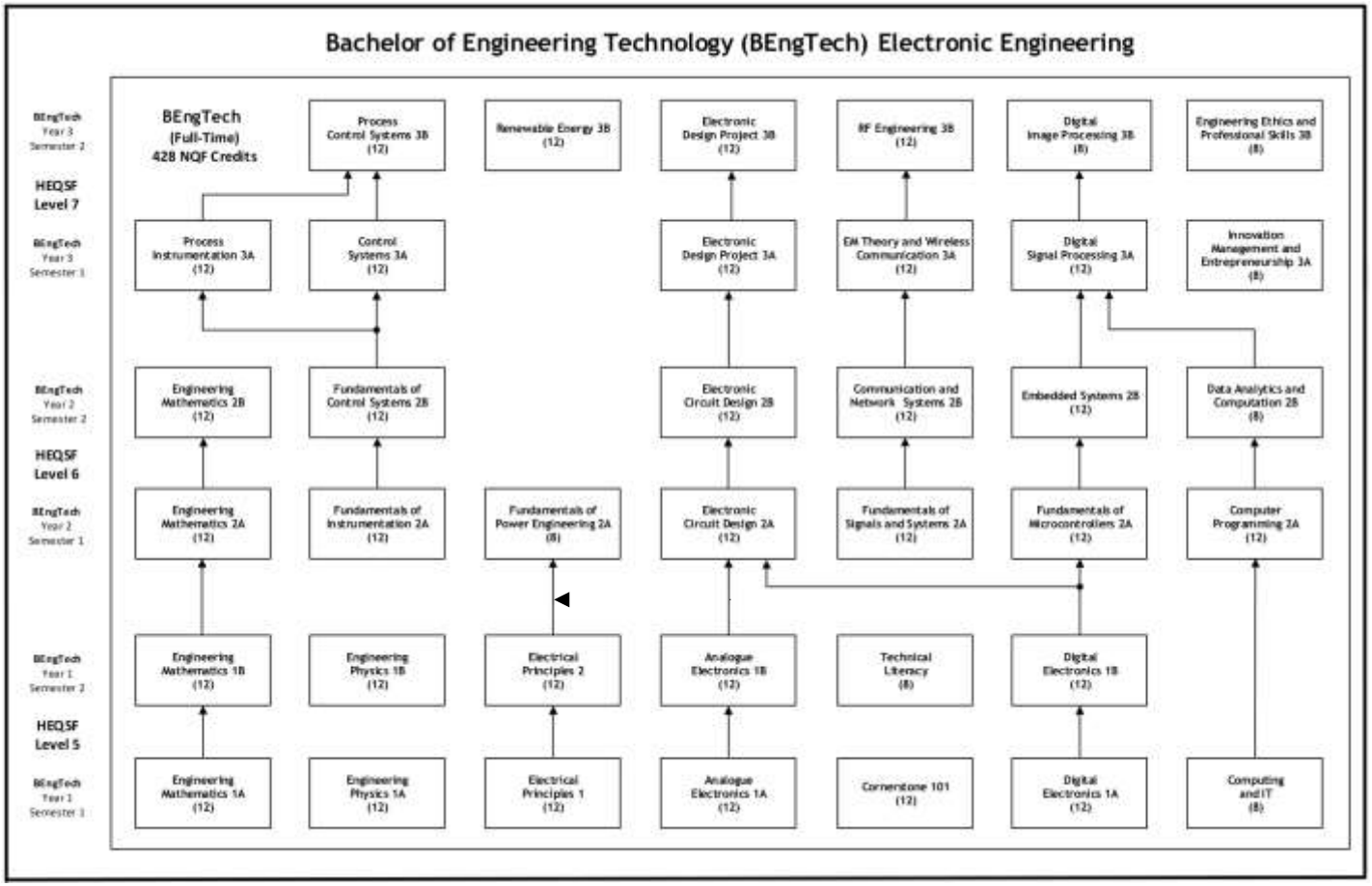
(4) Students will NOT be allowed to exceed a maximum of 80 credits per semester.

BE6 AWARDING OF THE DEGREE

Degrees are not automatically awarded to candidates who have satisfied all of the requirements for the instructional programme. The onus is on the student to apply to the University for the awarding of the degree. In this regard, the candidate must obtain the necessary forms from the Secretary of the Department.

BE7 PROGRAMME STRUCTURE

The figure below illustrates the overall programme. The arrows in the figure usually imply exposure to a priori knowledge and are primarily meant to illustrate the cohesive path through the qualification. A clearer understanding of the structure is provided in the subsequent tables below. All modules listed are compulsory. The programme is offered on a full-time basis and requires attendance to lectures, practicals, and tutorials. The method by which they will be examined is indicated in each module study guide. The meaning of pre- and co-requisite is given in the G-rules and is not repeated here; the meaning of exposure is described by BE4 above.


Bachelor of Engineering Technology (BEngTech) Electronic Engineering
BEngTech
(Full-Time)
428 NQF Credits
BEngTech Year 3 Semester 2
HEQSF Level 7
BEngTech Year 3 Semester 1
BEngTech Year 2 Semester 2
HEQSF Level 6
BEngTech Year 2 Semester 1
BEngTech Year 1 Semester 2
HEQSF Level 5
BEngTech Year 1 Semester 1
Process Control Systems 3B (12)
Renewable Energy 3B (12)
Electronic Design Project 3B (12)
RF Engineering 3B (12)
Digital Image Processing 3B (8)
Engineering Ethics and Professional Skills 3B (8)
Process Instrumentation 3A (12)
Control Systems 3A (12)
Electronic Design Project 3A (12)
EM Theory and Wireless Communication 3A (12)
Digital Signal Processing 3A (12)
Innovation Management and Entrepreneurship 3A (8)
Engineering Mathematics 2B (12)
Fundamentals of Control Systems 2B (12)
Electronic Circuit Design 2B (12)
Communication and Network Systems 2B (12)
Embedded Systems 2B (12)
Data Analytics and Computation 2B (8)
Engineering Mathematics 2A (12)
Fundamentals of Instrumentation 2A (12)
Fundamentals of Power Engineering 2A (8)
Electronic Circuit Design 2A (12)
Fundamentals of Signals and Systems 2A (12)
Fundamentals of Microcontrollers 2A (12)
Computer Programming 2A (12)
Engineering Mathematics 1B (12)
Engineering Physics 1B (12)
Electrical Principles 2 (12)
Analogue Electronics 1B (12)
Technical Literacy (8)
Digital Electronics 1B (12)
Engineering Mathematics 1A (12)
Engineering Physics 1A (12)
Electrical Principles 1 (12)
Analogue Electronics 1A (12)
Cornerstone 101 (12)
Digital Electronics 1A (12)
Computing and IT (8)

	Name of Module	Subject Code	Study Level	Credits	NQF Level	Pre-Requisite	Co-Requisite	Exposure (40%)
Year 1 Semester 1	Engineering Mathematics 1A	EMTA101	1	12	5	Nil	Nil	Nil
	Engineering Physics 1A	EPHA101	1	12	5	Nil	Nil	Nil
	Electrical Principles 1	ELEP101	1	12	5	Nil	Nil	Nil
	Analogue Electronics 1A	ANLA101	1	12	5	Nil	Nil	Nil
	Digital Electronics 1A	DGEA101	1	12	5	Nil	Nil	Nil
	Computer and IT	CPUT101	1	8	5	Nil	Nil	Nil
	Cornerstone 101	CSTN101	1	12	5	Nil	Nil	Nil
	Engineering Equipment Issue	ENEQ101	1	0	N/A	Nil	Nil	Nil
Year 1 Semester 2	Engineering Mathematics 1B	EMTB101	1	12	5	Nil	Nil	EMTA101 Engineering Mathematics 1A
	Engineering Physics 1B	EPHB101	1	12	5	Nil	Nil	Nil
	Electrical Principles 2	ELEP201	1	12	6	ELEP101 Electrical Principles 1	Nil	Nil
	Analogue Electronics 1B	ANLB101	1	12	6	ANLA101 Analogue Electronics 1A	Nil	Nil
	Digital Electronics 1B	DGEB101	1	12	6	DGEA101 Digital Electronics 1A	Nil	Nil
	Technical Literacy	TELC101	1	8	5	Nil	Nil	Nil
	TOTAL CREDITS SEMESTER 1&2			**148**				

	Name of Module	Subject Code	Study Level	Credits	NQF Level	Pre-Requisite	Co-Requisite	Exposure (40%)
Year 2 Semester 1	Engineering Mathematics 2A	EMTA201	2	12	6	EMTB101 Engineering Mathematics 1B	Nil	Nil
	Fundamentals of Power Engineering 2A	FUPE201	2	8	6	ELEP201 Electrical Principles 2 ANLB101 Analogue Electronics1B	Nil	Nil
	Fundamentals of Instrumentation 2A	FIST201	2	12	6	EMTB101 Engineering Mathematics 1B	Nil	Nil
	Fundamentals of Signals and Systems 2A	FCMC201	2	12	6	EMTB101 Engineering Mathematics 1B	EMTA201 Engineering Mathematics 2A	Nil
	Fundamentals of Microcontrollers 2A	MCRD201	2	12	6	DGEB101 Digital Electronics 1B	Nil	Nil
	Electronic Circuit Design 2A	ECDS201	2	12	6	ANLB101 Analogue Electronics1B DGEB101 Digital Electronics 1B	MCRD201 Fundamentals of Microcontrollers 2A	Nil
	Computer Programming 2A	CPTP201	2	12	6	CPUT101 Computer and IT	Nil	Nil
Year 2 Semester 2	Engineering Mathematics 2B	EMTB201	2	12	6	Nil	Nil	EMTA201 Engineering Mathematics 2A
	Fundamentals of Control Systems 2B	FCNS201	2	12	6	EMTA201 Engineering Mathematics 2A FIST201 Fundamentals of Instrumentation 2A	Nil	Nil
	Communication and Network Systems 2B	FNTW201	2	12	6	EMTA201 Engineering Mathematics 2A FCMC201 Fundamentals of Signals and Systems 2A	Nil	Nil
	Electronic Circuit Design 2B	ECDS301	2	12	6	ECDS201 Electronic Circuit Design 2A	Nil	Nil
	Embedded Systems 2B	MCRD301	2	12	6	MCRD201 Fundamentals of Microcontrollers 2A	Nil	Nil
	Data Analytics and Computation 2B	CPTP301	2	8	6	CPTP201 Computer Programming 2A	Nil	Nil
	TOTAL CREDITS SEMESTER 3&4			**148**				

	Name of Module	Subject Code	Study Level	Credits	NQF Level	Pre-Requisite	Co-Requisite	Exposure (40%)
Year 3 Semester 1	Process Instrumentation 3A	PINA301	3	12	7	FIST201 Fundamentals of Instrumentation 2A	CSYA301 Control Systems 3A	Nil
	Control Systems 3A	CSYA301	3	12	7	FCNS201 Fundamentals of Control Systems 2B EMTB201 Engineering Mathematics 2B	NIL	Nil
	EM Theory and Wireless Communication 3A	RFEA301	3	12	7	FNTW201 Communication and Network Systems 2B EMTB201 Engineering Mathematics 2B	Nil	Nil
	Digital Signal Processing 3A	DSPA301	3	12	7	FCMC201 Fundamentals of Signals and Systems 2A EMTB201 Engineering Mathematics 2B	Nil	Nil
	Electronic Design Project 3A	EDPA301	3	12	7	ECDS301 Electronic Circuit Design 2B	Nil	Nil
	Innovation Management and Entrepreneurship 3A	PJCT101	3	8	7	Nil	Nil	Nil
Year 3 Semester 2	Process Control Systems 3B	PCSB301	3	12	7	PINA301 Process Instrumentation 3A CSYA301 Control Systems 3A	Nil	Nil
	RF Engineering 3B	RFEB301	3	12	7	RFEA301 EM Theory and Wireless Communication 3A	Nil	Nil
	Renewable Energy 3B	RENE301	3	12	7	FUPE201 Fundamentals of Power Engineering 2A	Nil	Nil
	Digital Image Processing 3B	DSPB301	3	8	7	DSPA301 Digital Signal Processing 3A	Nil	Nil
	Electronic Design Project 3B	EDPB301	3	12	7	EDPA301 Electronic Design Project 3A	Nil	Nil
	Engineering Ethics and Professional Skills 3B	PRIM101	3	8	7	Nil	Nil	Nil
	TOTAL CREDITS SEMESTER 5&6			**132**				

	TOTAL CREDITS (BEngTech)			**428**

BE7 ABRIDGED MODULE CONTENT

Analogue Electronics 1A

This course provides an understanding of the fundamentals of analogue electronics and basic circuit design; teaches construction and analysis of working electronic circuits; and exposes students to appropriate electronic circuits simulation software packages. Topics include semiconductor theory, diode applications, special-purpose diodes, transistors, transistors amplifiers, power supplies and test equipment.

Analogue Electronics 1B

This module aims to provide the student with analysis and design skills for a wide range of analogue systems; and to expose students to software packages used in simulating various electronic circuits. Topics include output power stages and heatsinks; switching regulators; field-effect transistors; differential pair and current sources; operational amplifiers; negative and positive feedback; wave shaping and waveform generators; and filters and their realisations.

Communication and Networks Systems 2B

This course covers the fundamental concepts of data and computer communications, including a basic understanding of computer networks and communication protocols. Topics will include the OSI (physical and data link layers) and TCP/IP (link and internet layers) models; basic concepts of computer networks including types of computer networks, LAN technologies, Wireless LANs and topologies.

Computer Programming 2A

This course covers the fundamental concepts of programming using a high-level computer programming language; and will enable a learner to use a programming language in an application to solve an engineering problem. Introduction to top-down design methods; integrated development environments (IDEs); GUI design; structure of a programme: pre-processor directives, declarations, procedures; control structures: relational expressions, control structures, loop structures; programme timers; and file access.

Computer and Information Technology (IT)

This course aims to provide a student with the knowledge and understanding of personal computers in terms of hardware, computer operating systems, word processing and spreadsheets; and to expose students to engineering software packages to solve engineering and logical problems. Topics include computer hardware, structure, and operating systems; computer software and the use of applications, explanation of computer networks; security of computer systems, such as computer viruses, malware, phishing etc; applications and demonstration of software to solve financial, mathematical, and engineering problems and to present results graphically; and portfolio based on computer soft and hardware.

Control Systems 3A
This course uses classical, modern and digital control theories and techniques control to design control systems. Topics include compensator (including PID controller) design using time and frequency domain techniques; control system design using the state space approach and including pole placement design and observer design; introduction to digital control; discretization of continuous-time state-space systems; realization theory; stability of digital systems; and digital control system design.

Cornerstone 101
The purpose of this module is to induct students into the community of higher education, with values and practices that promote self-awareness, social justice and environmental sustainability. The module content will be developed around the concept of journeys, across time, space, and human relationships. The module will bring different disciplinary perspectives to this content – environmental, historical and sociological. The metaphor of the journey will be sustained across the module and will be applied to personal journeys, historical, political and environmental journeys, and social journeys, with a specific focus on gender. Each section will draw in issues of ethics, diversity and critical citizenry.

Data Analytics and Computation 2B
Data analytics is the science of examining raw data with the purpose of drawing conclusions about that information. It is used in many industries to allow companies and organizations to make better business decisions and in the sciences to verify or disprove existing models or theories. Data analytics is also used in engineering decision making as well as for the understanding of phenomena to assist in better engineering design for socio-technical systems. This module will include the development of mathematical and processing techniques for data analysis. Topics include descriptive statistics and probability, inferential statistics, regression and analysis of variance, data analytics software tools (for example, Python and/or MATLAB), introduction to machine learning, supervised learning with regression and classification techniques.

Digital Electronics 1A
This module aims to provide the fundamental principles of digital systems and covers thoroughly both traditional and modern methods of digital systems and to promote student understanding of logical principles and applied design applications for direct entry into the industry. Topics include an introduction to digital electronics, number systems and coding, basic logic functions, logic tools and techniques, combinational logic circuits, introduction to sequential logic, simulation of logic circuits, introduction to programmable logic devices (PLDs).

Digital Electronics 1B
The purpose of this course is to apply the foundations of the pre-requisite digital electronics module in a broad spectrum of varying digital circuit applications encountered in modern technology. Topics include sequential logic circuits;

multivibrators; data converters; memory technology; PLD configuration and programming; IC technologies; and displays

Digital Image Processing 3B
The purpose of this course is to understand the fundamentals of digital image processing and digital image filter design; and to develop the theoretical and practical expertise of students in modelling, manipulating, and extracting information from, digital images. Students must be able to present various techniques in modelling and designing digital image filters. Topics include digital image fundamentals, image enhancement in the spatial domain, morphological image processing, image segmentation, and colour image processing.

Digital Signal Processing 3A
This module aims to understand the fundamentals of digital signal processing and digital filter design, and to develop the theoretical and practical expertise of students in modelling and representing digital signals and systems. Students must be able to present various techniques in modelling and designing digital filters and perform spectral analysis. Topics include an overview of systems and signal; signal energy and power; signal symmetry; decimation and interpolation; sampling theorem and aliasing; discrete-time systems; LTI systems; causality; the response of digital filters; difference equations; impulse response; discrete convolution; the z-transform/inverse z -transform; region of convergence (ROC); poles, zeros, and the z-plane; transfer functions; discrete-time Fourier transform; frequency response and filter characteristics; FIR and IIR filter design; and multi-rate digital signal processing.

Electrical Principles 1
This subject reinforces the concepts and principles of electrical engineering. It requires the student to apply established electrical concepts, principles and theorems in problem-solving for electrical circuits. Topics include established electrical principles and laws; network theorems, conversions and applications; and passive components in DC circuits.

Electrical Principles 2
This course will provide the student with the necessary foundational knowledge for understanding diverse applications in electrical engineering, and teach the fundamentals of electrical circuit analysis. Topics include an introduction to alternating current (AC); capacitor and inductor in AC circuit; RC and RL circuits; RLC circuits and resonance; analysis of AC circuits; network theorems and conversions; and introduction to three-phase systems.

Electronic Circuit Design 2A
This course fully utilizes knowledge learned in all the fundamental electric and electronic modules for advanced circuit modelling, design, and simulation. The module contributes to engineering science through circuit analysis, problem-solving, computer simulations, and applications of mathematics, physics, and electronics. Throughout this

course, students will gain practical circuit design skills and apply them to real-world electronic product development. Topics include safety issues; electrostatic discharge protection; review of basic instruments (physical and virtual); review of electronic components; function of equipment; features of equipment; characteristics of equipment; electronic test equipment; measurement techniques; standards and calibration; power sources such as basic power supply circuits, batteries, etc.; operational amplifier circuits (inverting and non-inverting amplifiers, summers, etc.); limitations and strengths of integrated circuit operational amplifiers; analogue filter circuits; nonlinear operational amplifier circuits; simple oscillators; interface circuits to motors, relays, lamps, etc., using discrete transistors (bipolar and MOSFET); fundamentals of engineering design; basic sensor concepts - how circuits see, feel, hear, etc.; LED's, lasers, phototransistors, and other interesting optoelectronic devices; useful circuit building blocks and tricks; digital-to-analogue and analogue-to-digital concepts; digital and analogue circuit integration; building analogue and digital prototype circuits; debugging prototype circuits; introduction to CAE for PCB design; introduction to CAE for simulation of circuits; design and construction of integrated digital and analogue circuits; and project documenting and reporting.

Electronic Circuit Design 2B

This course will complement Electronic Circuit Design 2A, with the emphasis being made on integrated digital and analogue circuit design. Topics include a review of engineering design processes – conceptual, preliminary, final design and; implementation; analogue-to-digital conversion; sensors; introduction to modular circuit design: integration of analogue, digital and microcontroller systems; designing integrated modular prototype circuits; modular circuit simulation; building integrated modular prototype circuits; debugging integrated modular prototype circuits; design project; project documenting and reporting; and project presentation.

Electronic Design Projects 3A

This module involves the application of knowledge attained during the programme. Students will be placed into groups and collectively apply engineering principles to systematically diagnose and solve broadly defined engineering problems. Each group will demonstrate their knowledge in applying engineering principles to project development and design, and analysis of results; as well as demonstrate effective communication (both orally and in writing within an engineering context) and time management.

Electronic Design Projects 3B

This module involves the application of knowledge attained during the programme. Each student will apply engineering principles to systematically diagnose and solve broadly defined engineering problems. Each student will demonstrate his/her knowledge in applying engineering principles to project development and design; and analysis of results; as well as demonstrate effective communication (both orally and in writing within an engineering context) and time management.

EM Theory and Wireless Communication 3A

This module introduces electromagnetic (EM) communications theory and wireless systems. Topics include electromagnetic waves and the electromagnetic spectrum: the need for modulation; RF communication: the RF spectrum; the role of an antenna in a wireless communications system; the decimal scale; power measurement in dBW and dBm; gain and attenuation measurement in dB; free-space propagation and path loss; reflection, refraction and diffraction; electromagnetic wave on an open-wire transmission line and the concept of characteristic impedance; antenna fundamentals: radiation mechanism of a half-wave dipole; fundamental parameters of antennas including gain, polarisation, impedance, beamwidth and bandwidth; design of a linear wire half-wave dipole using software; analogue modulation: AM and FM; digital modulation; ASK, FSK, PSK, QPSK and QAM; fibre-optic communication: light propagation in fibre; transmitter devices and circuits; receiver devices and circuits; and link analysis.

Embedded Systems 2B

This course will provide a general introduction to embedded system design using RISC technology. Embedded systems contain both hardware and software components and therefore a hardware/software co-design is emphasized. The course will give basic knowledge on specification methods, design representations (computational models) as well as related design methods. Special emphasis will be put on interface synthesis and low-power design methods. Topics include an overview of embedded systems; background concepts for embedded systems; designing, testing and running embedded systems; CISC vs RISC (concept, architecture, and instruction set); RISC processor programming and debugging techniques (JTAG); embedded C language; timers; serial and parallel communication; ADCs, PWM, interrupts and more.; interfacing LEDs, motors, buzzers, LCDs, sensors, etc.; RTOS; introduction to FPGAs; and VHDL for FPGAs.

Engineering Ethics and Professional Skills 3B

The purpose of this module is to provide students with an overview of engineering ethics and professional skills. Topics include ethics for multicultural societies and workplaces; why be ethical; workplace ethics; professional ethics for engineers and others who work with them; ethics in engineering; skills for handling dilemmas; sustainability concerns and the move toward sustainable development; EIA as the only mandatory tool under environmental legislation; and corporation and sector technology strategies to address current and future sustainability challenges.

Engineering Mathematics 1A

This module comprises the mathematical knowledge and skills which are necessary to underpin the general engineering science that is assumed to be essential for most engineering graduates. The course will provide insight to understand and analyse the engineering problems scientifically based on Mathematics. Topics include revision of

basic algebra, absolute values, logarithms (law and equations, natural, functions), exponential functions, introduction to trigonometry, trigonometric waveforms, trigonometric identities & equations, functions & their curves, inverse functions, hyperbolic functions, Cartesian and polar coordinates, complex number formats, De Moivre's formulas, roots of complex numbers, limit concepts and calculations, introduction to differentiation (derivative, slope, velocity, rate of change), methods of differentiation, differentiation of functions (algebraic, trigonometric and hyperbolic), applications of differentiation (related rates, tangents and normals), anti-differentiation, Riemann sum, integration of functions (algebraic, trigonometric and hyperbolic) and applications of integration (areas).

Engineering Mathematics 1B

This module comprises the mathematical knowledge and skills which are necessary to underpin the general engineering science that is assumed to be essential for most engineering graduates. The course will provide insight to understand and analyse the engineering problems scientifically based on Mathematics. Topics include the theory of matrices and determinants, determinants of 2nd and 3rd order, finding inverses using the adjoint, solution of simultaneous equations (Cramer's rule, inverse method, Gaussian elimination), Maclaurin series, relationship between trigonometry and hyperbolic functions, differentiation of parametric equations, differentiation of hyperbolic functions, differentiation of inverse trigonometry and inverse hyperbolic functions, partial differentiation, total differentiation, rates of change & small change, maxima, minima and saddle points for function of two variables, integration using algebraic substitutions, integration using trigonometry and hyperbolic substitutions, integration by partial fractions, t-substitution, applications of integration (area and volume), solution of first-order ordinary differential equations (ODEs), separation of variable, homogenous first-order ODEs, linear first-order ODEs, 3-dimensional coordinate systems, simple graphs (planes, spheres, lines), finding distances, dot product, cross product and applications of vectors (simple line integrals).

Engineering Mathematics 2A

This module comprises the mathematical knowledge and skills which are necessary to underpin the general engineering science that is assumed to be essential for most engineering graduates. The course will provide insight to understand and analyse the engineering problems scientifically based on Mathematics. Topics include an introduction to Laplace transforms, properties of Laplace transforms, inverse Laplace transforms, solution of differential equations using Laplace transforms, solution of simultaneous differential equations using Laplace transforms, numerical solutions of differential equations, second-order differential equations, introduction to partial differential equations (PDEs), Poisson's and Laplace's equations, potential, heat and wave equations, Fourier series for periodic functions of period 2π and Fourier series of non-periodic functions over period 2π.

Engineering Mathematics 2B

This module comprises the mathematical knowledge and skills which are necessary to underpin the general engineering science that is assumed to be essential for most engineering graduates. The course will provide insight to understand and analyse the engineering problems scientifically based on Mathematics. Topics include double integrals, further multiple integrals, line integrals, triple products, partial differentiation of vectors, scalar and vector fields, Stoke's theorem, Green's theorem, matrix methods, Eigenvalue problems, Cayley-Hamilton theorem, modal and spectral matrices, system of first-order differential equations, system of second-order differential equations, functions of a complex variable, complex mappings, linear and non-linear transformations, Cauchy-Riemann equations, complex integration, contour integration, Fourier transforms, and z-transforms and inverse z-transforms.

Engineering Physics 1A

Engineering physics will focus on the general application of mathematical and scientific principles of physics to the analysis and evaluation of engineering problems. Topics include an introduction, measurement, estimating, motion in one dimension, kinematics in two dimensions; vectors, dynamics: Newton's laws of motion, circular motion; gravitation, work and energy, linear momentum, rotational motion, static equilibrium; elasticity and fracture, fluids, oscillations and waves, and sound.

Engineering Physics 1B

Engineering physics will focus on the general application of mathematical and scientific principles of physics to the analysis and evaluation of engineering problems. Topics include temperature and kinetic theory, heat, the laws of thermodynamics, electric charge and electric field, electric potential, electric currents, DC circuits, magnetism, electromagnetic induction and Faraday's law, electromagnetic waves, light: geometric optics, the wave nature of light, early quantum theory and models of the atom, quantum mechanics of atoms, and nuclear physics and radioactivity.

Fundamentals of Control Systems 2B

Introduction to control systems engineering. Topics include open and closed-loop systems; system models, for example, differential equations, state-space representation, transfer functions, block diagrams and signal flow graphs; control system inputs, including impulse, step, ramp, parabola, sinusoidal and combinations of these; solution to the models based on the control system inputs; analysis of first and second-order system response; time-domain specifications and analysis including root locus plots; and frequency domain specifications including Bode, Nyquist and Nichols plots.

Fundamentals of Instrumentation 2A

This module provides an introduction to the instrumentation and control fields. Topics include control loop fundamentals; field measurement devices (temperature, pressure, level and flow); control modes; and instrumentation documentation.

Fundamentals of Microcontrollers 2A
This course introduces students to the field of microcontrollers – what they are and how they work; moreover, how they interface with I/O components, and what considerations the programmer has to observe in hardware-based and embedded programming. Topics include an overview of microprocessors and microcontrollers; microprocessor fundamentals and the microcontroller architecture; brief introduction to assembly language (operations and operands); basic data structures in assembly language; introduction to embedded c language; interface between C and assembly; basic I/O and timing (with analogue output); simple interrupts; intermediate timing; analogue-to-digital conversion (ADC); serial interfaces; advanced parallel I/O (configuration, interrupts); advanced timing (PWM, capture, compare); power management; special operations; rationale for PLD usage; PLD evolution; structure and operation of CPLDs; hardware description language (HDL); implementing PLD-based applications using hardware; state machine design; and PLD testing techniques.

Fundamentals of Power Engineering 2A
This subject introduces the subject of power electronics, which includes the switching, control and conversion of electrical power using semiconductor devices. Topics include power semiconductor diodes and circuits; diode rectifiers; DC-DC converters; PWM inverters; resonant pulse inverters; thyristors; controlling power using rectifiers; and AC voltage controllers.

Fundamentals of Signals and Systems 2A
This course provides an introduction to the basic concepts and theory of analogue and digital signal processing. Signal processing plays an extremely important role in a wide variety of engineering systems such as communication devices, robotics, automation, aircraft, spacecraft and biomedical systems. Topics include fundamental concepts of signals and systems; time-domain models of systems; Fourier series and Fourier transforms; convolution and correlation of signals; Laplace transform and the z - transform; analysis of continuous-time systems by transfer functions; filter concepts and design; and basic concepts of probability, random variables and random signals.

Innovation Management and Entrepreneurship 3A
The purpose of this module is to provide students with an overview of the concepts of innovation management and entrepreneurship. Topics include an introduction into economics, opportunity cost, economic systems and South Africa, demand, supply and prices, investment and inflation, economic growth and business cycles, a business marketing perspective, business marketing strategies, managing innovation and new industrial product development, supply chain management, entrepreneurship and managing innovation.

Process Control Systems 3B
This module introduces the students to automation systems, final control elements, loop control techniques, performance indices, plant design engineering, and machine control.

Process Instrumentation 3A
This module introduces the students to process analysers, unit operations, telemetry, control philosophies, process plant engineering, plant documentation and loop control techniques.

Renewable Energy 3B
This subject introduces the subject of renewable energy; this being the study of renewable energy resources, the AC and DC technologies involved as well as the applications in a modern energy-conscious society. Topics include energy resources and technologies; energy transfer; sustainable design; power conversion and integration technologies; wind turbines; solar power; marine energy; energy generation from biomass; geothermal energy; waste and energy; DC energy generation and systems; system integration and automation; exploitation of renewable energy resources; and socio-economics of renewable energy.

Radio Frequency Engineering 3B
This module introduces the design of radiofrequency circuitry in the VHF and UHF bands, with an emphasis on linear circuit design. Topics include an introduction to radio frequency engineering; linear versus non-linear networks; transmission lines; lumped element components at radio frequencies; impedance matching; network characterisation; small-signal amplifier design; noise in two-port networks; low-noise amplifier design; and system-level design.

Technical Literacy
This module prepares students to work independently and with groups, to responsibly, appropriately and effectively use technology tools to access, manage, integrate, evaluate, create and communicate technical information. Topics include the differences between language usage in academic, technical and common environments; experimental methods and the scientific method; planning and documenting experiments; technical report writing; plagiarism; referencing practice (DUT-Harvard, IEEE, etc); utilising spreadsheets for graphical presentation of information; and standards (ISO, SABS, etc).

BE8 SUPPLEMENTARY PROGRAMMES

The following two programmes, developed and facilitated by the Centre for Excellence in Learning and Teaching (CELT), have been conceptualised as a means of fostering student success through an integrated holistic approach to higher learning.

First-Year Student Experience (FYSE)

This programme is facilitated by senior students called Tutor-Mentor-Advisors (TMAs). The TMAs conduct seminars designed to help first-year students in all faculties of DUT understand the way learning, teaching and assessing are done at the university. The seminars build a student-centred educational experience to prepare first-year students to be critical thinkers for an increasingly diverse and complex local, national and globalized work environment. This programme was initiated to specifically address the transition from basic education to Tertiary education, Adaptation into the institutions of higher learning and success of first-year students.

Technology for Learning (TFL)

This is an integrated component of the FYSE. Following the paradigm shift adopted by many institutions of higher learning for a technology-based educational experience, the Centre for Excellence in Learning and Teaching designed a programme to train students on the online systems of learning readily available in the institution. This initiative seeks to ensure the effective use of all the technology tools that would enhance and enable a convenient learning experience.

Both programmes are highly recommended for all first-time entering Electronic and Computer engineering students. Contact CELT for more information and/or speak to the student representatives.

MASTER OF ENGINEERING (MEng)

ME1 GENERAL INFORMATION

This qualification is intended for persons who will contribute, through research, to understanding the application and evaluation of existing knowledge in a specialized area of technology. They will also demonstrate a high level of overall knowledge in that area, ranging from fundamental concepts to advanced theoretical or applied knowledge.

Students who have successfully completed the MEng degree should:

1. Be capable of assimilating and evaluating appropriate literature and resources to the field of study;
2. Be capable of determining and stating the objectives of a specific research topic and planning an appropriate strategy to reach the objectives;
3. Efficiently expedite the research strategy to generate an effective solution;
4. Be capable of evaluating the quality of the solution in terms of the stated objectives.

ME2 MINIMUM ADMISSION REQUIREMENTS

- Bachelor of Engineering Technology Honours (BEngTechHons) degree or an appropriate or related NQF Level 8 Engineering qualification.
- B-Tech (from an ECSA accredited South African UoT) through a conferment of status (COS) approved by the Faculty Executive Committee (EXCO). Additional entrance requirements and/or pre-requisites may apply.

NB. There are a limited number of postgraduate spaces available and preference will be given to applicants that have good academic track records and running averages and/or capstone projects above 60%.

Interested students must submit the required supporting documentation; refer to:
http://www.dut.ac.za/course/master_of_technology_engineering_electrical_lc/

ME3 AWARD OF THE DEGREE

This degree is awarded to a person who has executed and documented an engineering research project and communicated results by means of a dissertation that is concurred in terms of its content and level by a panel of external examiners and the higher degrees committee of the university. To vindicate the quality of the work undertaken, it is also recommended that the student publish their findings in at least one peer-reviewed accredited (ISI/DHET approved) conference or journal prior to submission for examination.

DOCTOR OF ENGINEERING (DEng)

DE1 GENERAL INFORMATION

This doctoral-level programme is intended for persons who will make a significant and original contribution to knowledge in a specialised area of technology. They will have a high level of overall knowledge in that specialised area ranging from fundamental concepts to advanced theoretical or applied knowledge.

This qualification combines academic research and scholarship with engineering practice and application. The academic degree awarded, which is based on an advanced study, research and thesis in engineering, is an equivalent NQF level 10 qualification as the PhD degree in engineering/applied sciences.

Students who have successfully completed the DEng degree should:

1. Be capable of assimilating and evaluating appropriate literature and resources to the field of study;
2. Be capable of determining and stating the objectives, a specific research topic and planning an appropriate strategy to reach the objectives;
3. Efficiently expedite the research strategy to generate an effective solution;
4. Be capable of evaluating the quality of the solution in terms of the stated objectives;
5. Be capable of guiding inexperienced researchers with research projects;
6. Be capable of synthesizing unique solutions to research problems.

DE2 MINIMUM ADMISSION REQUIREMENTS

- Master of Engineering (MEng) degree or an appropriate or related NQF Level 9 Engineering qualification.

Interested students must submit the required supporting documentation; refer to: http://www.dut.ac.za/course/doctor_of_technology_engineering_electrical_lc/

DE3 AWARD OF THE DEGREE

This degree is awarded to a person who has initiated and successfully executed research in the field of engineering. The research must be acknowledged as a significant contribution through a thesis that is concurred in terms of its content and level by a panel of external examiners and the higher degrees committee of the university. It is also recommended that prior to submission for examination the student publish their findings in at least one peer-reviewed accredited (ISI/DHET approved) journal. These academic recognitions set a seal of approval on the quality of the work undertaken.

RESEARCH

RE1 GENERAL INFORMATION

The department research committee (DRC), which monitors, promotes and manages all research activities within the department, advises the Head of Department with regards to postgraduate student-related issues. Persons interested in pursuing Masters (MEng) or Doctoral (DEng) research in the department should contact the Chair of the DRC, through the secretary and/or prospective supervisor via **email**, together with the following documentation:

(1) Certified copy of ID document/card (or passport)
(2) Complete transcripts of undergraduate and/or postgraduate qualification/s. Preference will be given to applicants that have good academic track records with running averages and/or capstone projects above 60%.
(3) Certified copy of your degree/s (or equivalent qualification/s)
(4) SAQA certification/s (if applicable)
(5) Copy of final year capstone project report or Masters dissertation (for DEng applicants) in PDF format.
(6) Mini proposal (1-2 pages) highlighting intended topic and research
(7) A list of published journal/conference articles, if any.

* Missing or incomplete application information will not be considered.

If the student meets the admission requirements (based on the above documentation), then s/he will be contacted by the department through a prospective supervisor. For Masters applications, the student will also have to submit a **preliminary research proposal** (contact department for the template) together with the "Notification of Proposed Research Topic and Supervisor" form, which will be tabled for consideration at the DRC.

Note: Both the research proposal and the dissertation/thesis must be **orally** defended by the student in the form of a presentation to members of the DRC and invited faculty members prior to being submitted to FRC and for examination, respectively.

RE2 RESEARCH FIELDS

Academic	Research Field	Description
Prof B Nleya	Optical Networks and Network Security	Energy-efficient networking, resources allocation and management in all optical networks as well as security and access control in IoT Enabled Networks.
Dr N Pillay	Applied Computational Intelligence	Application of artificial intelligence in process control, control loop optimization, nonlinear control and controller performance analysis for industrial control systems.
Dr N Singh	Bio-Engineering	Conscious control of the autonomic nervous system; understanding the central governor theory.
Mr KE Moorgas	Intelligent Systems	The merging of embedded systems with machine intelligence; includes topics such as machine learning, pattern recognition, image processing, computer and robotic vision, NLP and autonomous systems.
Mr R Sewsunker	Renewable Energy and Energy Efficiency using Distributed Intelligence	Specific focus on the emerging DC paradigm with current work on optimal control methods applied to DC nanogrids and microgrids. Other DC-related topics include optimised water pumping, intelligent lighting and smart metering.

END