

FACULTY of
ENGINEERING and the
BUILT ENVIRONMENT

DEPARTMENT of
ELECTRICAL POWER ENGINEERING

Handbook for 2010

DEPARTMENTAL MISSION

To be universally recognised as a leading provider of electrical engineering education.

DEPARTMENTAL MISSION

The School of Electrical Engineering, in collaboration with industry, provides aspiring electrical engineering technicians and technologists with excellence in technological skills, entrepreneurship and leadership, through innovative learning, development and research.

DEPARTMENTAL AIMS AND OBJECTIVES

The general aims and objectives of the department are:

- to develop and enhance the critical, analytical and intellectual abilities of the student;
- to enable the student to conceptualise and deal with specific and complex issues and problems in the field of electrical engineering;
- to increase the student's ability to think independently and communicate clearly;
- to develop a rigorous critical approach to data collection and analysis to develop a strategic view of the complete electrical industry;
- to provide a basic practical familiarity with systems and components used in the electrical industry, and
- to prepare students to work both as a member of a team and independently on electrical projects.

What is a University of Technology?

A university of technology is characterised by being research informed rather than research driven where the focus is on strategic and applied research that can be translated into professional practice. Furthermore, research output is commercialized thus providing a source of income for the institution. Learning programmes, in which the emphasis on technological capability is as important as cognitive skills, are developed around graduate profiles as defined by industry and the professions.

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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

1. CONTACT DETAILS

All departmental queries to:

Secretary: Ms P Naidu
Tel No: 031 – 373 2062
Fax No: 031 – 373 2063
Location of Department : Steve Biko Campus, S7 L300

All Faculty queries to:

Faculty officer: Ms A Mqoboli
Tel No: 031 – 373 2907
Fax No: 031 – 373 2719
Location of Faculty office: Steve Biko Campus, S4 L300

Executive Dean: Prof T Andrew
Tel No: 031 – 373 2720
Fax No: 031 – 373 2724
Location of Executive Dean's office: Steve Biko Campus, S8 L5

2. STAFFING

	Name and Qualification
Head of Department:	Mr ER Bussy, MSc (UKZN), NDT (TN); Dip.Dat. (UNISA); GCC
Senior Director:	Mr GF d'Almaine, M.Dip. Tech (MLST)
Senior Lecturers:	Mr HP Bonnet, NDT (TN); NTTD Mr O Somera, NDT (MLST)
Lecturers:	Mr K Loji, B.Tech.Eng. (VUT), MSAIEE Mr KA Sirrals, NDT (TP) Mr RA Stops, B.Tech Eng (TN), BMDP, MSAIEE Mr J Soobramoney, NHD (MLST), B.Tech Pulp & Paper (MLST)
Junior Lecturer:	Mr D Chetty, B.Tech Eng (DUT)
Secretary:	Ms P Naidu, B.Tech: Information Technology (DUT)
Senior Technician:	Mr M Estrice. NTD; HDE
Technicians:	Mr DL Ramouthar Mr G Marimuthu Mr S Moodlier

3. PROGRAMMES OFFERED BY THE DEPARTMENT

The engineering profession contributes to the technical, social, economic and environmental infrastructure of the country, leading to socio-economic growth. A framework of engineering qualifications develops the human resources essential for sustaining the profession.

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

Qualification	SAQA NLRD Number
ND: Engineering: Electrical: (Heavy Current)	72228
BTECH: Engineering: Electrical: (Heavy Current)	72129
MTECH: Engineering: Electrical	72177
DTECH: Engineering: Electrical	72099

4. PROGRAMME INFORMATION AND RULES: NATIONAL DIPLOMA: ENGINEERING: ELECTRICAL

This qualification is designed for the development of engineering technicians. A graduate with this qualification will be:

- Competent to apply an integration of theory, principles, proven techniques, practical experience and appropriate skills, to the solution of well defined problems in the field of electrical engineering while operating within the relevant standards and codes;
- Able to work independently, and as a member of a team;
- Able to register with the Engineering Council of South Africa (ECSA) as a Candidate Engineering Technician in the field of Electrical Engineering.
- This diploma is abbreviated as N. Dip.

a) Suitable Candidate Selection

- i) On the basis of a variety of placement assessments, successful applicants for study towards a National Diploma will be accepted into either a three-year minimum or an augmented, four-year minimum programme of study. An augmented curriculum is devised in order to enhance student development and to improve the student's chances of successful completion.
- ii) The department reserves the right to request prospective students to undergo an aptitude test.
- iii) Selection of students is strictly on merit. Where there are more students than places available, selection will be based on academic performance in English, Mathematics and Physical Science.
- iv) Final selection (into either the mainstream or foundation programmes) is made at the full discretion of the Head of

Department based on a number of factors including class size, equity etc.

b) Minimum Admission Requirements

In addition to the general admission requirements as stated in the General Rules, the following minimum requirements (or their equivalent) shall apply:

i) Senior Certificate (SC) Symbols

Mathematics	HG E or SG C
Science	HG E or SG C
English	HG Pass or SG Pass

In addition, a learner must obtain a minimum of a total score of 35 when using the following scoring system for Senior Certificate Subjects* to be conditionally accepted into a mainstream programme (less than a total of 35 implies conditional acceptance into a foundation programme)

Scoring system: using the table below, determine the scores associated with each SC subject result obtained, multiply the mathematics and science scores by two and add all the scores together to obtain a total.

Symbol	A	B	C	D	E	F
HG	8	7	6	5	4	3
SG	6	5	4	3	2	1

* Preference will be given to technical subjects

i) National Senior Certificate (NSC) Requirements

English (Home)	4
OR English (1st Additional)	4
Mathematics	4
Physical Science	4
And three 20 Credit subjects (not more than one language)	4

ii) National N4 Certificate

N4 Certificate with passes at 50% in four (4) relevant subjects including Mathematics and Electro-technics, or an equivalent SAQA NQF Level 4 qualification, as well as compliance with the English language requirements as stated in the General Rules.

iii) Foreign qualifications

Foreign Qualifications must be evaluated in accordance with the G7(9), or failing that, by the SAQA at full Senior Certificate level or higher.

b) Programme Structure

There are two (2) fields of study, being Power Plant, and Power Systems.
See the Tables below:

NATIONAL DIPLOMA: Engineering Electrical (Power Plant) (Theory for Electrical Engineer's Certificate of Competency)							
Code	Subjects:	*C/O	Semester /Year	Assessment Method	NQF Level	Pre-requisite	Co-req.
	Communication Skills I	C	S1	Continuous Evaluation	5		
	Computer Skills I	C	S1	Continuous Evaluation	5		
	Electrical Engineering I	C	S1	Exam	5		
	Electronics I	C	S1	Exam	5		
	Mathematics I	C	S1	Exam	5		
	Engineering Mechanics I	C	S1	Exam	5		
	Projects I	C	S1	Continuous Evaluation	5		
	Electrical Engineering II	C	S2	Exam	5	Electrical Engineering I & Mathematics I	
	Electronics II	C	S2	Exam	5	Electronics I & Electrical Engineering I & Mathematics I	
	Mathematics II	C	S2	Exam	5	Mathematics I	
	Mechanical Technology I	C	S2	Exam	5	Mechanics I	
	Projects II	C	S2	Continuous Evaluation	5	Projects I	
	Strength of Materials II	C	S3	Exam	5	Mechanics I	
	Electrical Engineering III	C	S3	Exam	6	Electrical Engineering II	
	Electrical Machines II	C	S3	Exam	5	Electrical Engineering II	
	Industrial Electronics II	C	S3	Exam	5	Electrical Engineering II & Mathematics II	
	Mathematics III	C	S3	Exam	6	Mathematics II	
	Mechanical Technology II	C	S3	Exam	5	Mechanical Technology I	
	Strength of Materials III	C	S4	Exam	6	Strength of Materials II	
	Design Project III	C	S4	Continuous Evaluation	6	Projects II & Electrical Engineering III	
	Electrical Distribution III	C	S4	Exam	6	Electrical Engineering III	
	Electrical Machines III	C	S4	Exam	6	Electrical Machine II	
	Electrical Protection III	C	S4	Exam	6	Electrical Engineering III	
	Mechanical Technology III	C	S4	Exam	6	Mechanical Technology II	
PETR301	Power Electronics III	C	S4	Exam	6	Industrial Electronics II	

C = Compulsory; O = Optional

NATIONAL DIPLOMA: Engineering Electrical (Power Systems)

(A general option)

Code	Subjects:	*C/O	Semester /Year	Assessment Method	NQF Level	Pre-requisite	Co-req.
	Communication Skills I	C	S1	Continuous Evaluation	5		
	Computer Skills I	C	S1	Continuous Evaluation	5		
	Electrical Engineering I	C	S1	Exam	5		
	Electronics I	C	S1	Exam	5		
	Mathematics I	C	S1	Exam	5		
	Engineering Mechanics I	C	S1	Exam	5		
	Projects I	C	S1	Continuous Evaluation	5		
	Electrical Engineering II	C	S2	Exam	5	Electrical Engineering I & Mathematics I	
	Electronics II	C	S2	Exam	5	Electronics I & Electrical Engineering I & Mathematics I	
	Mathematics II	C	S2	Exam	5	Mathematics I	
	Digital Systems I	C	S2	Exam	5	Electronics 1	
	Projects II	C	S2	Continuous Evaluation	5	Projects I	
	Electrical Engineering III	C	S3	Exam	6	Electrical Engineering II	
	Electrical Machines II	C	S3	Exam	5	Electrical Engineering II	
	Industrial Electronics II	C	S3	Exam	5	Electrical Engineering II & Mathematics II	
	Mathematics III	C	S3	Exam	6	Mathematics II	
	Digital Systems II	C	S3	Exam	5	Digital Systems	
	Design Project III	C	S4	Continuous Evaluation	6	Projects II & Electrical Engineering III	
	Electrical Distribution III	C	S4	Exam	6	Electrical Engineering III	
	Electrical Machines III	C	S4	Exam	6	Electrical Machine II	
	Electrical Protection III	C	S4	Exam	6	Electrical Engineering III	
	Control Systems II	O	S4	Exam	6	Mechanical Technology II	
PETR301	Power Electronics III	C	S4	Exam	6	Industrial Electronics II	

C = Compulsory; O = Optional

d. ASSESSMENT PLAN

As indicated in the Tables, some subjects are continuously evaluated, while others are assessed with a combination of course work and final examination.

i) Continuously Evaluated Subjects

The method of evaluation for these subjects is stipulated in the relevant subject Study Guide.

(1) Course Work and Examined Subjects

(2) Course marks will be calculated as follows:

Tests (at least two) constitute 70% of course mark.

Assignments and practical component together constitute 30% of course mark

ii) A sub-minimum mark of 50% for the course practical component is required to obtain a valid course mark for the particular subject.

iii) A minimum course mark of 40% must be obtained to enable a student to write the final examinations.

iv) Only registered students qualify for a course mark.

A sub-minimum examination mark of 40% must be obtained to enable a student to pass.

(1) In accordance with G 15(9), the final pass mark is calculated as follows:

Examination - 60%

Course mark - 40%

(2) A final mark of at least 50% is required to pass.

e. RE-REGISTRATION RULES

i) No registration for any subject will be allowed later than one week after commencement of lectures.

ii) No learner will be allowed to register for a subject if there is a timetable clash with any other subject.

iii) No student will be permitted to register for any subject combination where there will be any lecture clashes. In the event of there being a clash then the student will be required to register for the subject from the lowest level of the qualification for which they are registering.

f. PROMOTION TO A HIGHER LEVEL

i) S1 to S2

The student must pass at least 0.4 credits at level S1 before registering for any subjects in the level S2.

ii) S2 to S3

The student must pass all S1 subjects and at least 0.4 credits at the S2 level before registering for any subjects in the level S3.

iii) S3 to S4

The student must pass all S2 subjects and at least 0.4 credits at the S3 level before registering for any subjects in the level S4.

g. MONITORING OF ACADEMIC PROGRESS

- i) A student who does not complete half of the subjects of semester S1 in the first semester of registration will be given a warning of "UNSATISFACTORY PROGRESS".
- ii) A student who does not meet the requirements for promotion to a higher level will not be permitted to continue with the diploma.
- iii) A student who has not passed any subject after having registered for it twice will NOT be permitted to continue with the diploma.
- iv) The student must pass ALL the specified subjects for the diploma within eight registered semesters of study.

h. ABSENCE FROM CLASS TESTS AND PRACTICAL SESSIONS

A special test may be granted by the Head of Department to a student who has been prevented from taking a test:

(Where the student is unable to return to class within two days of missing the event, it is the student's responsibility to contact the department to inform them of the late return. Documented proof of the reasons for absence must then be submitted within two 2) working days of returning.)

- i) By illness on the day of the test or immediately before it, provided that he/she submits a medical certificate on the prescribed form G194 on which a medical practitioner, registered by the Health Professions Council of SA, homoeopath or chiropractor, registered with the South African Associated Health Board, specifies the nature and duration of the illness and that for health reasons it was impossible or undesirable for the student to sit for the test, and that he/she submits such certificate to the Head of Department on the day as determined by the practitioner that the student should return to lectures immediately following such illness, or on one of the two following working days;

Note: Medical certificates issued after the student's recovery will not be accepted under any circumstances.

OR

- i) By circumstances which in the opinion of the Head of Department were beyond his/her control at the time of the test provided that satisfactory evidence of such circumstances is provided. Such circumstances shall not include:
 - (1) any misinterpretation by him/her of the date, time or venue of the test;
 - (2) transportation difficulties, where his/her residential term time address is within the area serviced by a scheduled bus or

commuter train service to central Durban area, and provided otherwise that he/she informs the Head of Department of such difficulty prior to the time of commencement of the test;

- (3) failure by him/her to bring to the test venue any equipment normally required for that subject as specified in the study guide for the particular subject;
- (4) participation in events, unless the student is granted permission to be absent BEFORE the evaluation takes place.

For the purpose of this rule, "test" shall mean any written, oral or practical test, set for the purpose of determining or contributing towards a semester mark for a subject, and shall include tests set for subjects which are evaluated by continuous evaluation.

Any student who misses a test and who does not qualify for a special test, and any student who qualifies for a special test and fails to write it, shall be awarded a zero mark for the missed test.

i. CONDUCT

This is to be read in conjunction with the STUDENT CODE OF CONDUCT in the General Handbook:

- (1) Class Rooms and Laboratories
- (2) Disruptive behaviour and vandalism will be dealt with in terms of the student disciplinary code.
- (3) Eating, smoking or drinking in the classrooms is strictly forbidden.
- (4) Safety rules must be strictly observed at all times.
- (5) Attendance and punctuality are essential.

j. TOOLS

Students are expected to supply their own basic tools as required in certain subjects as specified in the relevant study guide. All learners registering for this programme for the first time will be required to pay a toolkit levy in addition to the standard course fee.

k. PROJECT FEE

Students registering for project based subjects may be required to pay a project fee in addition to the standard tuition fee.

l. WORK INTEGRATED LEARNING (WIL)

Work integrated learning within the electrical power industry forms an essential part of the requirements for the National Diploma: Engineering: Electrical (Power). Such formal experiential learning as specified by the departmental experiential learning program is uniquely competency based with predefined outcomes. This incorporates a recommended syllabus in which proven competencies are to be developed. Variations to such syllabi

in individual cases, is possible, subject to prior written motivation to the department and its subsequent approval.

It is the learner's responsibility to investigate and secure appropriate experiential learning opportunities within the industry. The onus is upon the learner to verify that experiential learning offered by a service provider, complies with departmental requirements prior to commencement of such learning and or paying any training fees.

Registration procedures may be conducted with the department through electronic media.

An informative overview guide to the competency based experiential training requirements of the department is available in both hard copy and electronic formats.

Note: Rules indicated here-under are subject to the competency based departmental requirements as indicated and explained in the experiential learning guides.

- i) Electrical Engineering Practice 1 [P-1] (0,05 credits)
 - (1) Prerequisites: Completed S2 academic module including the academic subject, Electrical Engineering II.
 - (2) Minimum duration: 6 months, of prior specified and departmentally approved, competency based, full time training to specification in accordance with the departmental syllabus.
 - (3) Academic reporting: Portfolio development to departmental experiential learning outcome standards.

- ii) Electrical Engineering Practice 2 [P-2] (0,5 credits)
 - (1) Pre-requisites: Completed S4 academic module, including the academic subjects, Electrical Distribution III and Electrical Protection III.
 - (2) Minimum duration: 6 months, of prior specified and approved competency based training, conducted in industry in accordance with the departmental exposure domain guide.
 - (3) Academic reporting: Portfolio development plus industrial project report both to departmental academic experiential learning outcome standards.

- iii) Departmental / Faculty Registration
 - (1) Module registration must be departmentally approved, prior to engaging in any experiential learning activities.
 - (2) Registration is not be subject to any census date.
 - (3) Provisional registration: Subject to the submission of completed documents comprising of the provisional application form and an industrial service provider's generated memorandum of understanding (MoU).

- (4) Module registration: Subject to approval of documents in point C 3 above, plus the payment of the required academic and registration fees applicable. Module registration must be concluded within ONE academic month (a 28 day period excluding official institutional academic vacation periods) in which such departmentally approved training has commenced.
 - (5) Late registration: Will only be considered where module registration has been departmentally approved but proof of registration is outstanding. In such cases only up to the end of the second month with the proviso that the registration date will be reflected as the date of presentation of the proof of payment.
 - (6) Concession Registration: Considered at P-1 level only, and then by prior motivation, in support of approved technical trades. Such registration, if approved, will be subject to point C 4 and C 5 above as well as the portfolio requirement as per point B 3 above.
 - (7) No student may register for a full time subject at any institution while completing WIL, except Design Project III.
- iv) Change of service providers
Experiential learning transfers between different service providers must meet the prior approval of the department to ensure compliance with the registered training Memory of Understanding (MoU).
- v) Academic accreditation of registered modules
- (1) Portfolios may not be lodged for assessment before the minimum registered training period has expired.
 - (2) Developed portfolios are due within 1 month of completion of the training period.
 - (3) Completed portfolios will be assessed in accordance with departmental experiential learning outcome standards, the reported outcomes will be subject to faculty and examination verification and notice. Unsatisfactory assessments would require re-submission to the final approval of the department.

2) PROGRAMME INFORMATION AND RULES: BACCALAUREUS TECHNOLOGIAE: ENGINEERING: ELECTRICAL

a) PURPOSE STATEMENT: BACHELOR OF TECHNOLOGY: ENGINEERING: ELECTRICAL

The engineering profession contributes to the technical, social, economic and environmental infrastructure of the country, leading to socio-economic growth. A framework of engineering qualifications develops the human resources essential for sustaining the profession. Within that framework, this qualification is designed for the development of engineering technologists.

A graduate with this qualification will be able to:

- Apply engineering principles to systematically diagnose and solve ill defined problems in an engineering environment within a chosen field of specialization.
- Communicate technical, supervisory and general management information effectively.
- Apply management principles and concepts to manage projects and/or operations within an engineering environment.
- Conduct and manage a research/development project.
- Exercise independent technological judgment and responsible decision making by taking into account the relevant financial, economic, commercial, social, environmental and statutory factors.
- The qualified person will be able to register with the Engineering Council of South Africa (ECSA) as a Candidate Engineering Technologist in the field of Electrical Engineering.
- Able to register with the Engineering Council of South Africa (ECSA) as a Candidate Engineering Technician in the field of Electrical Engineering.

This diploma is abbreviated as B. Tech

b) Admission Criteria

- i) The entrance qualification is the National Diploma: Engineering: Electrical; subject to having been completed within 8 semesters of registration, (including all experiential training requirements).
- ii) A student who has taken more than 8 semesters to complete the National Diploma will be accepted for the degree programme after obtaining a minimum of one year of post diploma industrial experience.
 - (1) Persons in possession of other similar qualifications may apply to have them evaluated for acceptance.

c) Programme Structure

Subjects are selected from the Table below:

Baccalaureus Technologiae: Engineering Electrical (Heavy Current)							
Code	Subjects:	*C/O	Semester /Year	Assessment Method	NQF Level	Pre-requisite	Co-req.
	Electrical Machines IV	C		Exam	7	Electrical Machines III	
	Electrical Protection IV	C		Exam	7	Electrical Protection III	
	Electric and Magnetic Field Theory IV	C		Exam	7	Electrical Engineering III	
	High Voltage Engineering IV	C		Exam	7	Electrical Engineering III	
	Circuit Analysis IV	C		Exam	7	Electrical Engineering III	
	Illumination IV	C		Exam	7	Electrical Engineering III	
	Plant Engineering and Legal Knowledge IV	C		Exam	7	Electrical Engineering III	
	Power Electronics IV	C		Exam	7	Electrical Engineering III	
	Power Systems IV	C		Exam	7	Electrical Engineering III	
	Protection Technology IV	C		Exam	7	Electrical Engineering III	
	Control Systems IV	O		Exam	7	Control Systems III	
	Engineering Mathematics IV	O		Exam	7	Mathematics III	
	Engineering Management IV OR Entrepreneurship IV*	O		Continuous Evaluation	7		
	Project Research IV	O					
	Project Management IV	O					
	Industrial Project IV	C					

* C = Compulsory; O = Optional

- A minimum of four (4) compulsory (C) subjects MUST be offered.
- Industrial Project IV is ALWAYS compulsory

d) INDUSTRIAL PROJECT IV

- (1) An industrial project having a minimum duration 300 hours must be undertaken.
- (2) The project is supervised by Durban Institute of Technology staff.
- (3) Unless special permission is granted by the Head of Department, Industrial Project IV may only be registered after the student has obtained at least 0.4 subject credits.
- (4) Where all requirements of Industrial Project IV have been met within the first two registrations, the credit will be deemed to have been obtained at first attempt and in one semester for the purposes of rule G(18)(9)(a)(I).

e) ASSESSMENT PLAN

As indicated in the Tables, some subjects are continuously evaluated, while others are assessed with a combination of course work and final examination.

i) Continuously Evaluated Subjects

The method of evaluation for these subjects is stipulated in the relevant subject Study Guide.

ii) Course Work and Examined Subjects

(1) Course marks will be calculated as follows:

Tests (at least two) constitute 70% of course mark.

Assignments and practical component together constitute 30% of course mark

(2) A sub-minimum mark of 50% for the course practical component is required to obtain a valid course mark for the particular subject.

(3) A minimum course mark of 40% must be obtained to enable a student to write the final examinations.

(4) Only registered students will qualify for a course mark.

(5) A sub-minimum examination mark of 40% must be obtained to enable a student to pass.

(6) In accordance with G 15(9), the final pass mark is calculated as follows:

Examination - 60%

Course mark - 40%

(7) A final mark of at least 50% is required to pass.

f) EXEMPTIONS

i) Where tuition is not provided at the Durban University of Technology, a student may apply to the Head of Department to study the subject at another university of technology and be exempted from doing the subject at this University.

ii) Exemptions will only be given for a maximum of 0.5 credits.

g) RE-REGISTRATION RULES

i) No registration for any subject will be allowed later than one week after commencement of lectures.

ii) No learner will be allowed to register for a subject if there is a timetable clash with any other subject.

iii) No student will be permitted to register for any subject combination where there will be any lecture clashes. In the event of there being a clash then the student will be required to register for the subject from the lowest level of the qualification for which they are registering.

h) MONITORING OF ACADEMIC PROGRESS

- i) A student who does not pass half of the subjects registered for in any semester of registration will be given a warning of "UNSATISFACTORY PROGRESS" the first time this happens. If this happens again the student will NOT be permitted to continue with the Degree.
- ii) A student who has not passed any subject after having registered for it twice will NOT be permitted to continue with the Degree.
- iii) From the first registration for Industrial Project IV, a student must complete it within 3 consecutive semesters, or the learner will NOT be permitted to continue with the degree.

i) METHOD OF TUITION

- i) Tuition is provided for the majority of students who are registered on a part time basis. The department cannot guarantee that enough subjects will be available for students who wish to register on a full-time basis.
- ii) Subjects can only be offered where the department has the capacity and where there is sufficient demand.

j) ABSENCE FROM CLASS TESTS AND PRACTICAL SESSIONS

A special test may be granted by the Head of Department to a student who has been prevented from taking a test:

(Where the student is unable to return to class within two days of missing the event, it is the student's responsibility to contact the department to inform them of the late return. Documented proof of the reasons for absence must then be submitted within two (2) working days of returning.)

- i) By illness on the day of the test or immediately before it, provided that he/she submits a medical certificate on the prescribed form G194 on which a medical practitioner, registered by the Health Professions Council of SA, homoeopath or chiropractor, registered with the South African Associated Health Board, specifies the nature and duration of the illness and that for health reasons it was impossible or undesirable for the student to sit for the test, and that he/she submits such certificate to the Head of Department on the day as determined by the practitioner that the student should return to lectures immediately following such illness, or on one of the two following working days;

NOTE: Medical certificates issued after the student's recovery will not be accepted under any circumstances.

OR

- ii) By circumstances which in the opinion of the Head of Department were beyond his/her control at the time of the test provided that satisfactory evidence of such circumstances is provided. Such circumstances shall not include:

- (1) any misinterpretation by him/her of the date, time or venue of the test;
- (2) transportation difficulties, where his/her residential term time address is within the area serviced by a scheduled bus or commuter train service to central Durban area, and provided otherwise that he/she informs the Head of Department of such difficulty prior to the time of commencement of the test;
- (3) failure by him/her to bring to the test venue any equipment normally required for that subject as specified in the study guide for the particular subject;
- (4) participation in events, unless the student is granted permission to be absent BEFORE the evaluation takes place.

For the purpose of this rule, "test" shall mean any written, oral or practical test, set for the purpose of determining or contributing towards a semester mark for a subject, and shall include tests set for subjects which are evaluated by continuous evaluation.

Any student who misses a test and who does not qualify for a special test, and any student who qualifies for a special test and fails to write it, shall be awarded a zero mark for the missed test.

k) CONDUCT

This is to be read in conjunction with the STUDENT CODE OF CONDUCT in the General Handbook:

- (1) Class Rooms and Laboratories
- (2) Disruptive behaviour and vandalism will be dealt with in terms of the student disciplinary code.
- (3) Eating, smoking or drinking in the classrooms is strictly forbidden.
- (4) Safety rules must be strictly observed at all times.
- (5) Attendance and punctuality are essential.

l) APPEALS

Any student wishing to appeal against the implementation of any of these rules must do so in terms of Rule G1 in the general rule book for students.

2) RULES FOR POST GRADUATE DEGREES

a) NAME OF DEGREE

MAGISTER TECHNOLOGIAE: ENGINEERING: ELECTRICAL: (POWER)

This is abbreviated as M.Tech.

i) PURPOSE STATEMENT

This degree is awarded to a person who has executed and documented a developmental or investigative electrical engineering research project and communicated results by means of at least one refereed conference paper at national level. This demonstration of self-motivation, adherence to rigorous research techniques and interaction with a critical audience is a distinguishing credential for specialised work requiring a disciplined approach, up-to-date technical knowledge, creativity and the exercise of communication skills. Learners interested in a suitable research programme should contact the Head of Department.

ii) Rules

See Rules G32 to G39 & G40 to G44 in the Rule Book for Students.

b) NAME OF DEGREE

DOCTORATE TECHNOLOGIAE: ENGINEERING: ELECTRICAL:
(POWER)

This is abbreviated as D.Tech.

i) PURPOSE STATEMENT

This degree identifies the holder as a person who has initiated and successfully executed a developmental or investigative research project in the field of electrical engineering, which has been acknowledged as a significant contribution by acceptance for publication of at least one article in a refereed international journal, and the concurrence of the panel examining the thesis. This academic recognition sets a seal of approval on the quality of the work done. Learners interested in a suitable research programme should contact the Head of Department.

ii) RULES

See Rules G36 to G44 in the Rule Book for Students.

3) SUBJECT CONTENT
a) NATIONAL DIPLOMA LEVEL COURSES

COMPUTER SKILLS I:

Microcomputer; Software; Computer utilisation.

COMMUNICATION SKILLS I:

Communication theory; Oral presentation; Technical writing skills; Group communication skills.

CONTROL SYSTEMS II:

Introduction to control systems and MATLAB, dynamic models of physical systems, standard control system inputs, solutions to transfer function and state space models, transient and steady state response of first and second order systems, time domain specifications.

DESIGN PROJECT III:

The design, construction, testing and documentation of a complete project in electrical engineering. The standard of which is to be comparable with this level of study.

DIGITAL SYSTEMS I:

The decimal, binary and hexadecimal number systems. The BCD system. Conversion between systems. Alphanumeric binary codes. Parity. Gray code. Basic logic functions. The AND, OR and NOT. The NAND, NOR XOR and XNOR. The universality of NAND and NOR. Dual symbols. Simplification using Boolean algebra. Simplification using the Karnaugh map. Combinational logic circuits. Functions of combinational logic, Adders, Comparators, Decoders, Encoders, Code converters, Multiplexers and Demultiplexers. Sequential logic circuits. Latches and Flip-Flops. Shift registers. Counters.

DIGITAL SYSTEMS II:

Sequential logic circuits. JK and D flip flops and latches, operation, applications, timing diagrams, counters, shift registers, serial/parallel data transfer, sequence tables, astable and monostable multivibrators. Interfacing and data converters. Interface busses, digital to analog and analog to digital converters, parameters and performance issues. Memory devices. Data and Program memory devices. Flash memories. Application in microcomputers. Integrated circuit technologies. Displays. Multiplexing.

ELECTRICAL DISTRIBUTION III:

Introduction; Generation Technologies; Tariffs; Switch-gear and Sub-station Technology; Overhead lines; Underground cables and insulation co-ordination; Quality of Supply and Energy Efficiency; New developments.

ELECTRICAL ENGINEERING I:

Quantities and applications; Batteries; DC theory network analysis; Measurements; Electromagnetism; Magnetic circuits; Inductance; Capacitance; Basic A.C. theory.

ELECTRICAL ENGINEERING II:

A.C. Networks; Resonance; Power factor correction; Circuit theorems (DC and AC network analysis); Harmonics; Three-phase circuits.

ELECTRICAL ENGINEERING III:

Advanced three-phase circuits; Transmission lines; Power systems; Fault analysis.

ELECTRICAL ENGINEERING PRACTICE I:

(assessed through a portfolio development) Orientation; Safety and first aid; Basic hand skills; Measuring instruments; Motor starters and generators; Industrial lighting, Conduits/cables and wiring work; Programmable devices; Variable speed drives; Industrial instruments. Various electives apply.

ELECTRICAL ENGINEERING PRACTICE II:

(assessed through a portfolio development) On-site working exposure in design, installation, maintenance to, testing and fault finding on and or commissioning on three of the following:- Generation Technology, Electrical distribution and reticulation, Electrical protection, Electrical machinery, Electrical plant maintenance, Quality of electric supply and energy management.

ELECTRICAL MACHINES II:

Single phase transformers - Construction, Principles of Operation, Loading, regulation, Efficiency, Testing. Moving machinery Introduction. Synchronous machines - Construction, Principle of operation. Induction machines - Construction, Principle of Operation, Starting, Speed, Torque. DC machines - Construction, Types, Design of Generators, Design of Motors, Starters and Speed Control.

ELECTRICAL MACHINES III:

DC Machines - Armature Reaction, Commutation. Three phase transformers - Nomenclature and connections, Construction, Parallel operation, Windings, Materials, Oils and insulants, magnetic circuits, tap Changing, auto-transformers. Induction motors - Equations and Phasor Diagrams, Circle Diagram, Steady state performance, Starting, Speed Control, Braking. Synchronous machines - Synchronous Power and Torque, Voltage regulation, Load Diagrams, V-curves, Parallel operation. Special machines —Introduction of the following machines: Instrument Transformers, Single phase fractional-kilowatt motors.

ELECTRICAL PROTECTION III:

Introduction; Fundamental theory; Over voltage protection; Fault calculations; Fuses and links; Circuit-breaker analysis and testing under fault conditions; Instrument transformers; Protective relays; Elementary protection schemes.

ELECTRONICS I:

Basic measurements; Semiconductor theory; Diodes; Transistor theory; Applied technology.

ELECTRONICS II:

Field effect transistors; Other semiconductor devices; Basic rectification; Single stage transistor amplifiers; Operational amplifiers; Applied technology.

ILLUMINATION 3:

Lighting Design and calculation.

INDUSTRIAL ELECTRONICS II:

Basic Instrument Systems. Measurement and Control Systems. Performance Terms Errors, Calibration, Standards. Sensors Temperature (RTD's, Thermocouples, Thermistors), Pressure (Bourdon Tube, Bellows, Capacitance, Ultra sonic), Flow (Mag flow meters), Speed (Tachometers), Displacement Transducers (LVDT's). Signal Convertors - Signal Conditioning, Wheatstone bridge, Potentiometer Measurement System, Signal processing, Amplifiers, Signal Transmission. Displays Types, Operation. Fibre Optics - Light acceptance, Attenuation, Bandwidth, Modulation. Optical Fibre Systems. PLC's

MATHEMATICS I:

Determinants; Algebra; Trigonometry; Complex numbers; Hyperbolic functions; Differentiation; Integration.

MATHEMATICS II:

Differentiation; Integration; Matrix algebra; Differential equations (1st/2nd order).

MATHEMATICS III:

Fourier Analysis; Differential equations (La Place)

MECHANICAL ENGINEERING DRAWING I:

Instruments; Sketching; Pictorial drawing; Orthographic projection; Mechanical Engineering; Drawing.

MECHANICS I:

Static's; Dynamics.

MECHANICAL TECHNOLOGY I:

Toothed gears; Clutches; Belt and rope drives; Block and band brakes; Governors; Conveyors; Dynamics; Hoists, haulage and rope ways; Wire ropes; Balancing; Introduction to gas laws.

MECHANICAL TECHNOLOGY II:

Thermodynamics; Steam and steam generation; Internal Combustion engines; Combustion of fuels; Air compressors; Bearings; lubrication; Refrigeration and air conditioning; Pollution and water purification.

MECHANICAL TECHNOLOGY III:

Thermodynamics; Turbines; Hydrodynamics; Flow; Pumps; Fluid couplings; Fans; Materials.

POWER ELECTRONICS III:

Introduction to Power Electronics; Power semiconductor switches; Conduction and switching Losses; Power Diodes - ratings and protection, series and parallel operation of diodes; Power Transistors; Power Metal-oxide Semiconductor Field-Effect Transistors (MOSFETS); Insulated Gate Bipolar Transistors (IGBTs); Thyristor Devices - SCR and its characteristics, ratings and power loss, protection, Basic SCR gate triggering; Single Phase Uncontrolled $\frac{1}{2}$ - and Full-wave Rectifiers; Single Phase $\frac{1}{2}$ - and Fully-Controlled Rectifiers; Applications - Variable DC Drives, 1, 2 and 4 quadrant drives, Semi-controlled rectifier controlling a DC motor, Waveforms and analysis.

PROJECTS I:

Introduction to project work; Basic hand skills; Design and manufacture of a small project; report writing.

PROJECTS II:

Basic electrical drawing; Computer aided design (AUTOCAD); The design and manufacture of a more complex project; report writing.

STRENGTH OF MATERIALS II:

Stress and strain; Shear force and bending moment; Torsion and circular shafts; Helical springs; Thin cylinders; Frames; Testing of materials

STRENGTHS OF MATERIALS III:

Framed structures (space); Catenaries; S.F. and B.M (built in beams, propped cantilevers); Uniformly varying loads; Moment of inertia; Bending stress; Eccentric loading; Reinforced concrete beams; Fatigue.

b) B. TECH LEVEL COURSES

ENGINEERING MATHEMATICS IV:

Matrix theory, Complex analysis, Z-Transforms, Fourier Transforms.

ELECTRICAL PROTECTION IV:

Fault calculations; The electric arc; Surge voltage theory; Earthing; Operation and transient performance of protective gear.

PROTECTION TECHNOLOGY IV:

Practical considerations; Standards and requirements; Major elements of protective systems; Protective schemes; Testing, commissioning and operating of protective schemes.

HIGH VOLTAGE ENGINEERING IV:

Insulation breakdown of solids, liquids and gases; High voltage generation; High voltage measurements; High voltage testing; Corona.

POWER SYSTEMS IV:

Transmission line design parameters; Steady state operation of transmission lines; Multi-port representation of power systems and load flow analysis; Control of power; Transient operation of transmission lines; Stability; H.V.D.C. transmission; Energy management systems; Tariffs.

PLANT ENGINEERING AND LEGAL KNOWLEDGE IV:

As required by the Government Engineer for the Government Certificate of Competency.

(NOTE: NO TUITION is given in this subject, but, exemption is given to those students who have a government Electrical Engineering Certificate of Competency.)

PROJECT MANAGEMENT IV (CIVIL):

Planning of Projects; Quality and time management of projects; Quality and time management; Management systems; Computer applications; Project.

ELECTRICAL MACHINES IV:

Generalised Machine Theory, Synchronous machines; Induction machines; Transformer harmonics.

POWER ELECTRONICS IV:

Three phase controlled and uncontrolled converters; D.C. drives; DC/ AC Inverters; A.C. drives; Power electronics in transmission systems.

CIRCUIT ANALYSIS IV:

Circuits with non-linear component; Circuits under transient conditions; Two port networks and transmission lines; Switching transient analysis.

INDUSTRIAL PROJECT IV:

A suitable industrial project chosen in conjunction with the student's employer as approved by the department.

ELECTRIC AND MAGNETIC CIRCUIT THEORY IV:

Principles of electro-magnetism; Electric charges; Magnetic field of steady state currents; Electromagnetic induction; Electro-mechanics

4) GENERAL INFORMATION

a) Engineering Council of South Africa (ECSA)

Private Bag X691, Bruma, 2026.

Tel: 011-6079500,

Fax: 011-6229295

Email: engineering@ecsca.co.za, website: www.ecsca.co.za

b) 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

c) South African Qualifications Authority (SAQA)

Postnet Suite 248, Private Bag X06, Waterkloof, 0145.

Tel: 012 482 0858

Fax: 012 482 0895, Website: www.saqqa.org.za