

# MAGISTER TECHNOLOGIAE: ENGINEERING: ELECTRICAL

(Structured)

Qualification code: MTEES0 - NQF Level 8

Campus where offered: Pretoria Campus (block-mode classes and research)

Last year of new intake: 2019

Teach-out (phase-out) date: 31 December 2021

Students registered for this qualification should complete their studies according to the teach-out date prescribed for the qualification, subject to the stipulations of Regulation 3.1.11 and 3.1.13 in the Students' Rules and Regulations.

Information on phased-out programmes can be obtained from the TUT website, [www.tut.ac.za](http://www.tut.ac.za).

Key to asterisks:

\* Information does not correspond to information in Report 151.

(Deviations approved by the Senate in March 2009.)

## CURRICULUM

Consult the 2019 Faculty Prospectus for the full contents of the qualification.

### SUBJECT GROUP 1: CONTROL AND IMAGE PROCESSING

#### FIRST OR SECOND SEMESTER

CODE	SUBJECT	CREDIT
CSY501T	Control Systems V	(0,100)
EAN501T	Engineering Analysis V	(0,100)
MII501T	Machine Intelligence V	(0,100)
RCS500T	Research Report: Engineering: Electrical: Control Systems V (year subject)	(0,500)
RCS500R	Research Report: Engineering: Electrical: Control Systems V (year subject) (re-registration)	(0,000)
RCS501R	Research Report: Engineering: Electrical: Control Systems V (re-registration)	(0,000)
RMD501C	Research Methodology	(0,050)
SII501T	Scientific Computing V	(0,050)

#### plus one of the following subjects:

EDD501T	Embedded Systems V	(0,100)
IAS501T	Image Analysis Systems V	(0,100)
RTS501T	Real-Time Systems V	(0,100)
SEI501T	Special Topics I*	(0,100)

TOTAL CREDITS FOR SUBJECT GROUP 1: **1,000**

### SUBJECT GROUP 2: ENERGY EFFICIENCY

#### FIRST OR SECOND SEMESTER

CODE	SUBJECT	CREDIT
EAN501T	Engineering Analysis V	(0,100)
EFS501T	Energy Efficiency and DSM V	(0,100)
REE500T	Research Report: Engineering: Electrical: Energy Efficiency V (year subject)	(0,500)



REE500R	Research Report: Engineering: Electrical: (0,000) Energy Efficiency V (year subject) (re-registration)	
REE501R	Research Report: Engineering: Electrical: (0,000) Energy Efficiency V (re-registration)	
RMD501C	Research Methodology	(0,050)
EGS501T	Energy Systems and Technology V	(0,100)
SII501T	Scientific Computing V	(0,050)

**plus one of the following subjects:**

CSY501T	Control Systems V	(0,100)
CVS501T	Conversion Systems V	(0,100)
EYE501T	Economics and Policy V	(0,100)
SEI501T	Special Topics I*	(0,100)

TOTAL CREDITS FOR SUBJECT GROUP 2: **1,000**

**SUBJECT GROUP 3: POWER ENGINEERING**

**FIRST OR SECOND SEMESTER**

CODE	SUBJECT	CREDIT
CVS501T	Conversion Systems V	(0,100)
EAN501T	Engineering Analysis V	(0,100)
PWS501T	Power Systems V	(0,100)
RMD501C	Research Methodology	(0,050)
RPN500T	Research Report: Engineering: Electrical: (0,500) Power Engineering V (year subject)	
RPN500R	Research Report: Engineering: Electrical: (0,000) Power Engineering V (year subject) (re-registration)	
RPN501R	Research Report: Engineering: Electrical: (0,000) Power Engineering V (re-registration)	
SII501T	Scientific Computing V	(0,050)

**plus one of the following subjects:**

CSY501T	Control Systems V	(0,100)
EEM501T	Electrical Machines and Drives V	(0,100)
EGS501T	Energy Systems and Technology V	(0,100)
PWN501T	Power Analysis V	(0,100)
SEI501T	Special Topics I*	(0,100)

TOTAL CREDITS FOR SUBJECT GROUP 3: **1,000**

**SUBJECT GROUP 4: TELECOMMUNICATION TECHNOLOGY**

**FIRST OR SECOND SEMESTER**

CODE	SUBJECT	CREDIT
DCO501T	Digital Communications V	(0,100)
EAN501T	Engineering Analysis V	(0,100)
RET500T	Research Report: Engineering: Electrical: (0,500) Telecommunication Technology V (year subject)	
RET500R	Research Report: Engineering: Electrical: (0,000) Telecommunication Technology V (year subject) (re-registration)	



RET501R	Research Report: Engineering: Electrical: (0,000) Telecommunication Technology V (re-registration)	
RMD501C	Research Methodology	(0,050)
SII501T	Scientific Computing V	(0,050)
TMM501T	Telecommunications V	(0,100)

**plus one of the following subjects:**

EDD501T	Embedded Systems V	(0,100)
HFS501T	High-Frequency Systems V	(0,100)
RTS501T	Real-Time Systems V	(0,100)
SEI501T	Special Topics I*	(0,100)

TOTAL CREDITS FOR SUBJECT GROUP 4: **1,000**

### SUBJECT INFORMATION (OVERVIEW OF SYLLABUS)

The syllabus content is subject to change to accommodate industry changes. Please note that a more detailed syllabus is available at the Department or in the study guide that is applicable to a particular module. On 01 October 2019, the syllabus content was defined as follows:

#### C

#### **CONTROL SYSTEMS V (CSY501T) CONTINUOUS ASSESSMENT**

**(Subject custodian: Department of Electrical Engineering)**

System modelling, discrete-time analysis and digital controller design. (Total tuition time: ± 90 hours)

#### **CONVERSION SYSTEMS V (CVS501T) CONTINUOUS ASSESSMENT**

**(Subject custodian: Department of Electrical Engineering)**

Converter theory, electromechanical systems, electric materials, EM field calculation, distribution (non-linear and transient problems, numerical methods, applications), transmission, planning and design. (Total tuition time: ± 90 hours)

#### D

#### **DIGITAL COMMUNICATIONS V (DCO501T) CONTINUOUS ASSESSMENT**

**(Subject custodian: Department of Electrical Engineering)**

Spectral analysis of common electronic signals: Fourier series and Fourier transform application. Source coding. Channel effect on symbol transmission and inter-symbol interference (ISI) control. Bandpass and multi-level digital modulation: generation, detection, probability of error, bandwidth efficiency, and applications. Channel coding and coding for reliable transmission over the channel. (Total tuition time: ± 90 hours)

#### E

#### **ECONOMICS AND POLICY V (EYE501T) CONTINUOUS ASSESSMENT**

**(Subject custodian: Department of Electrical Engineering)**

Energy economics aims to give students the essential knowledge that is needed to understand, analyse, assess and manage resources, economic and environmental interactions, the interactions and interrelationship between energy, economic and environmental systems in relation to the challenges of risks reduction from climate change. The subject is expected to equip the students with policy-making, management of sustainability issues and energy modelling. It will focus on issues such as economics and policies affecting the energy industry globally. (Total Tuition time: ± 90 hours)



**ELECTRICAL MACHINES AND DRIVES V (EEM501T)****CONTINUOUS ASSESSMENT****(Subject custodian: Department of Electrical Engineering)**

Electrical machines modelling and analysis, dynamic and transient analysis of electrical machines, design of electrical machines, vector control of asynchronous machines, electronically commutated machines, special electrical machines (switch reluctance motors, permanent magnet machines, electrical actuators, etc.). (Total tuition time: ± 90 hours)

**EMBEDDED SYSTEMS V (EDD501T)****CONTINUOUS ASSESSMENT****(Subject custodian: Department of Electrical Engineering)**

VHDL and FPGA design and real-time DSP implementation. (Total tuition time: ± 90 hours)

**ENERGY EFFICIENCY AND DSM V (EFS501T)****CONTINUOUS ASSESSMENT****(Subject custodian: Department of Electrical Engineering)**

The subject provides an introduction to energy management. Topics related to the design, implementation and assessment of energy management program (EMP) in relation to different environments such as residential, commercial, industrial, mining, transport etc. will be considered. The subject will also consider an introduction of demand-side management concepts for residential, commercial and industrial sectors. An introduction to Measurement and Verification (M&V) concepts will be covered. Corporate governance and good practices applicable to EMPs and M&V programs will also be covered. (Total Tuition time: ± 90 hours)

**ENERGY SYSTEMS AND TECHNOLOGY V (EGS501T)****CONTINUOUS ASSESSMENT****(Subject custodian: Department of Electrical Engineering)**

Modelling of alternative energy sources and corresponding technological options. (Total tuition time: ± 90 hours)

**ENGINEERING ANALYSIS V (EAN501T)****CONTINUOUS ASSESSMENT****(Subject custodian: Department of Electrical Engineering)**

Signal spaces, mappings, deterministic signal theory and stochastic signal theory. (Total tuition time: ± 90 hours)

**H****HIGH-FREQUENCY SYSTEMS V (HFS501T)****CONTINUOUS ASSESSMENT****(Subject custodian: Department of Electrical Engineering)**

HF system fundamentals and analysis, measurement principles and propagation models. (Total tuition time: ± 90 hours)

**I****IMAGE ANALYSIS SYSTEMS V (IAS501T)****CONTINUOUS ASSESSMENT****(Subject custodian: Department of Electrical Engineering)**

Image formation, frequency domain analysis, neighbourhood processing, texture, segmentation, shape, feature extraction, transformation and classification. (Total tuition time: not available)

**M****MACHINE INTELLIGENCE V (MII501T)****CONTINUOUS ASSESSMENT****(Subject custodian: Department of Electrical Engineering)**

Supervised learning (Bayesian classification, linear classifiers, non-linear classifiers, including neural networks and support vector machines), unsupervised learning and special topics, such as genetic algorithms and swarms and ants optimisation. (Total tuition time: ± 90 hours)

**P****POWER ANALYSIS V (PWN501T)****CONTINUOUS ASSESSMENT****(Subject custodian: Department of Electrical Engineering)**

Power flow analysis, stability analysis of power systems, control of power systems. (Total tuition time: ± 90 hours)

**POWER SYSTEMS V (PWS501T)****CONTINUOUS ASSESSMENT****(Subject custodian: Department of Electrical Engineering)**

Generation theory, transmission and distribution theory, interconnection of power systems. (Total tuition time: ± 90 hours)



**R**

**REAL-TIME SYSTEMS V (RTS501T)** **CONTINUOUS ASSESSMENT**  
(*Subject custodian: Department of Electrical Engineering*)

Advanced signal processing concepts (adaptive filtering, multirate processing and wavelets, filter banks etc.) with the emphasis on real-time DSP implementation. (Total tuition time: ± 90 hours)

**RESEARCH METHODOLOGY (RMD501C)** **CONTINUOUS ASSESSMENT**  
(*Subject custodian: Department of Electrical Engineering*)

Research methods and approaches, information-gathering approaches, writing research reports. (Total tuition time: ± 45 hours)

**RESEARCH REPORT: ENGINEERING: ELECTRICAL: CONTROL SYSTEMS V (RCS500T/R, RCS501R)** **MINI-DISSERTATION ASSESSMENT**  
(*Subject custodian: Department of Electrical Engineering*)

Syllabus content not available. Please contact the Head of the Department.

**RESEARCH REPORT: ENGINEERING: ELECTRICAL: ENERGY EFFICIENCY V (REE500T/R, REE501R)** **MINI-DISSERTATION ASSESSMENT**

(*Subject custodian: Department of Electrical Engineering*)

Syllabus content not available. Please contact the Head of the Department.

**RESEARCH REPORT: ENGINEERING: ELECTRICAL: POWER ENGINEERING V (RPN500T/R, RPN501R)** **MINI-DISSERTATION ASSESSMENT**

(*Subject custodian: Department of Electrical Engineering*)

Syllabus content not available. Please contact the Head of the Department.

**RESEARCH REPORT: ENGINEERING: ELECTRICAL: TELECOMMUNICATION TECHNOLOGY V (RET500T/R, RET501R)** **MINI-DISSERTATION ASSESSMENT**

(*Subject custodian: Department of Electrical Engineering*)

Syllabus content not available. Please contact the Head of the Department.

**S**

**SCIENTIFIC COMPUTING V (SII501T)** **CONTINUOUS ASSESSMENT**  
(*Subject custodian: Department of Electrical Engineering*)

Scientific computing fundamentals, simulation, C++, Matlab, Simulink and Scilab. (Total tuition time: not available)

**SPECIAL TOPICS I (SEI501T)** **CONTINUOUS ASSESSMENT**  
(*Subject custodian: Department of Electrical Engineering*)

Special topics based on a selection of seminal research papers from a chosen field. (Total tuition time: ± 90 hours)

**T**

**TELECOMMUNICATIONS V (TMM501T)** **CONTINUOUS ASSESSMENT**  
(*Subject custodian: Department of Electrical Engineering*)

Fixed networks, mobile networks, RF and optical networks. (Total tuition time: ± 90 hours)

