University of Pretoria Yearbook 2020

BEngHons Electrical Engineering (12240032)

Minimum duration of study	1 year
Total credits	128
NQF level	08

Programme information

The curriculum is determined in consultation with the relevant heads of departments. A student is required to pass modules to the value of at least 128 credits.

The degree is awarded on the basis of examinations only.

Admission requirements

- A BEng degree awarded by the University of Pretoria (or equivalent); or a four-year bachelor's degree in engineering that ECSA regards as acceptable for registration as a candidate engineer and for eventual registration as a professional engineer.
- The departmental Postgraduate Committee reserves the right to make a thorough assessment of the applicant's academic transcript and CV, and to decide if the applicant is suitable for postgraduate studies. This assessment may include an oral or written entrance examination.

Other programme-specific information

Students may take modules to the value of 32 credits from other fields of specialisation or from other departments, with approval of the Coordinator: Postgraduate Studies.

Examinations and pass requirements

i. The examination in each module for which a student is registered, takes place during the normal examination period after the conclusion of lectures (i.e. October/November or May/June).
ii. A student registered for the honours degree must complete his or her studies within two years (full-time), or within three years (part-time) after first registration for the degree: Provided that the Dean, on recommendation of the relevant head of department, may approve a stipulated limited extension of this period.
iii. A student must obtain at least 50% in an examination for each module where no semester or year mark is required. A module may only be repeated once.
iv. In modules where semester or year marks are awarded, a minimum examination mark of 40% and a final mark of 50% is required.
v. No supplementary or special examinations are granted at postgraduate level.

Pass with distinction

A student passes with distinction if he or she obtains a weighted average of at least 75% in the first 128 credits for which he or she has registered (excluding modules which were discontinued timeously). The degree is not awarded with distinction if a student fails any one module (excluding modules which were discontinued timeously).

Curriculum: Final year

Minimum credits: 128

EIN 732 is a compulsory module. With permission from the department it may be substituted with:
EPT 732 OR
EPT 733
EIN 732 is 'n verpligte module. Met toestemming van die departement mag dit vervang word met:
EPT 732 OF
EPT 733

Core modules

Optimal control 780 (EBO 780)

Module credits	32.00
Prerequisites	Introductory control course such as EBB 320
Contact time	32 contact hours per semester
Language of tuition	Module is presented in English
Department	Electrical, Electronic and Computer Engineering
Period of presentation	Semester 1

Module content

Optimal control of dynamic systems: continuous time systems, the Euler Lagrange equations, minimum time problems, the Pontryagin maximum principle; feasible control: computation of control input strategies for nonlinear systems such that the given control specifications are satisfied; feedback control of dynamic systems: dynamic programming for continuous time and discrete time nonlinear systems; applications in manufacturing systems; parametrisations of nonlinear/intelligent controller structures and applications of feasible control; linear systems: linear optimal control, linear optimal observers; application of feasible control in the computation of linear optimal output feedback controllers such that the design specifications are satisfied including: robustness against parameter variations, disturbance rejection, command following, frequency domain specifications.

Power electronics 780 (EED 780)

Module credits	32.00
Prerequisites	Undergraduate level Power electronics
Contact time	32 contact hours per semester
Language of tuition	Module is presented in English
Department	Electrical, Electronic and Computer Engineering
Period of presentation	Semester 1 or Semester 2

Module content

Power semiconductors - basic structure, I-V characteristic physics of device operation, switching characteristics, SOA; passive components; converter topologies - AC-DC rectifiers, DC-DC converters, DC-AC inverters, AC-AC converters and resonant converters; Dynamics and control - state space models, feedback control design; Ancillary issues - gate and base drives, snubber circuits and clamps, thermal modelling and heatsinking; Applications - electric utility applications, isolated switch-mode power supplies, optimising of the utility interface with power electronic systems.

Energy management 732 (EES 732)

Module credits	32.00
Prerequisites	No prerequisites.
Contact time	32 contact hours per semester
Language of tuition	Module is presented in English
Department	Electrical, Electronic and Computer Engineering
Period of presentation	Semester 2

Module content

Energy management theory, energy policy and strategic planning, load factor, diversity factor, load profiles, disaggregated load profiles, load duration plots, scatter plots, co-incident maximum demand, after-diversity maximum demand, seasonal swing, energy auditing, electricity pricing theory, electricity tariffs, energy norms, energy process modelling, demand-side management.

Power distribution engineering 732 (EEV 732)

Module credits	32.00
Prerequisites	No prerequisites.
Contact time	32 contact hours per semester
Language of tuition	Module is presented in English
Department	Electrical, Electronic and Computer Engineering
Period of presentation	Semester 1

Module content

Utility source, medium voltage distribution, balanced and unbalanced fault conditions and selection of protective equipment: First cycle fault current calculations, contact parting symmetrical current calculations, power circuit breaker selection. Shunt capacitors: Selection, transients. Motors and motor starting, power quality issues: dips, harmonics, unbalance and flicker.

Renewable energy 732 (EGH 732)

Module credits	32.00
Prerequisites	No prerequisites.
Contact time	32 contact hours per semester

Language of tuition	Module is presented in English
Department	Electrical, Electronic and Computer Engineering
Period of presentation	Semester 1 or Semester 2

Module content

This course will cover various renewable energy technologies including Wind, Solar Photovoltaic systems, Distributed generation and Hybrid power system.

Introduction to research 732 (EIN 732)

Module credits	32.00
Prerequisites	No prerequisites.
Contact time	16 contact hours per semester
Language of tuition	Module is presented in English
Department	Electrical, Electronic and Computer Engineering
Period of presentation	Semester 1 or Semester 2

Module content

*This is a compulsory module.

The aim of this module is to teach students to critically evaluate research literature, including conference papers and journal articles, in order to determine the current state of knowledge in a particular specialist area. It will also provide students with the principles of research to enable them to conduct research and prepare an original project in their particular specialist area.

Multivariable control systems 732 (EMB 732)

Module credits	32.00
Prerequisites	Introductory control course such as EBB 320
Contact time	32 contact hours per semester
Language of tuition	Module is presented in English
Department	Electrical, Electronic and Computer Engineering
Period of presentation	Semester 2

Module content

Introduction to linear dynamic systems: Modes, stability, controllability, observability, multivariable poles and zeros, state-space and transfer function descriptions. Singular values and singular value decomposition. Feedback performance specifications in the frequency domain. Synthesis via state space methods. Optimal control techniques, model predictive control.

Energy optimisation 732 (ENO 732)

Module credits	32.00
Prerequisites	No prerequisites.

Contact time	32 contact hours per semester
Language of tuition	Module is presented in English
Department	Electrical, Electronic and Computer Engineering
Period of presentation	Semester 1

Module content

In this module, a brief introduction about energy systems, energy system modelling and optimisation, and Matlab applications in energy optimisation problems are given. Practical industrial (as well as residential) energy management problems such as the load shifting for geysers, conveyor belts and pumping systems in terms of time-of-use tariff and/or maximum demand charge are covered.

Research project: Theory 732 (EPT 732)

Module credits	32.00
Prerequisites	No prerequisites.
Contact time	10 lectures per week
Language of tuition	Module is presented in English
Department	Electrical, Electronic and Computer Engineering
Period of presentation	Semester 1 or Semester 2

Module content

This module will cover the essential theoretical background of the student’s proposed M Eng topic and include inter alia the following:
(i) Field definition and descriptions
(ii) In-depth study into background and theory relevant to the problem to be addressed
(iii) Problem definition and description
(iv) Mathematical simulations of the problem

Research project: Design and laboratory 733 (EPT 733)

Module credits	32.00
Prerequisites	No prerequisites.
Contact time	10 lectures per week
Language of tuition	Module is presented in English
Department	Electrical, Electronic and Computer Engineering
Period of presentation	Semester 1 or Semester 2

Module content

This module will include extensive laboratory experiments to test the principles and possible solutions of the proposed M Eng research project and will include inter alia the following. These will include hardware and/or software experiments:
(i) Introduction to instrumentation and measuring techniques in general and specifically as applied in the field of research.
(ii) Structured laboratory work to introduce the specific problem investigated for the research undertaken.
(iii) Structured laboratory work to test the proposed solution for the problem addressed.
(iv) Confirmation experiments.

The information published here is subject to change and may be amended after the publication of this information. The General Regulations (G Regulations) apply to all faculties of the University of Pretoria. It is expected of students to familiarise themselves well with these regulations as well as with the information contained in the General Rules section. Ignorance concerning these regulations and rules will not be accepted as an excuse for any transgression.