University of Pretoria Yearbook 2024

BEngHons *Water Resources Engineering* (12240162)

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

Programme information

Refer also to G16-G29.

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

1. BEng degree awarded by the University of Pretoria **or** relevant four-year bachelor's degree in engineering that the Engineering Council of South Africa (ECSA) regards as acceptable for registration as a candidate engineer and for eventual registration as a professional engineer
2. A weighted average of at least 60% for the final year of the BEng degree
3. An entrance examination may be required
4. Comprehensive intellectual CV

Examinations and pass requirements

Refer also to G18 and G26.

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. G18(1) applies with the understanding that under exceptional circumstances an extension of a maximum of three years may be approved: provided that the Dean, on reccommendation 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% (not rounded) 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). The degree must be completed within the prescribed study period.

Curriculum: Final year

Minimum credits: 128

Additional information
Please note that not all modules are presented every year.

Core modules

- Select at least **72 credits** from the Core modules
- SSC 780 is a **compulsory** module
- Students select either SHC 798 **OR** SIK 790, not both

Elective modules

- Select electives from the following modules: SGC 794, SHC 793, SHC 796 and SSI 790

OR

- Electives can be selected from the following modules presented by the Department of Chemical Engineering: CEM 780, WAI 780, WBW 780, WCW 780 and WQB 780

Core modules

Flood hydrology 792 (SHC 792)

Module credits	24.00
NQF Level	08
Prerequisites	No prerequisites.
Contact time	32 Contact hours
Language of tuition	Module is presented in English
Department	Civil Engineering
Period of presentation	Year

Module content

A research term paper will be prepared.

This course entails the calculation of design flows for different return periods, using the statistical, deterministic – and empirical methods. Dambreak analysis is included in this course as well as channel and level pool routing.

Free surface flow 794 (SHC 794)

Module credits	24.00
NQF Level	08
Prerequisites	No prerequisites.
Contact time	32 Contact hours
Language of tuition	Module is presented in English
Department	Civil Engineering
Period of presentation	Year

Module content

A research term paper will be prepared.

This course entails the calculation of design flows for different return periods, using the statistical, deterministic – and empirical methods. Dambreak analysis is included in this course as well as channel and level pool routing.

Pipe flow 795 (SHC 795)

Module credits	24.00
NQF Level	08
Prerequisites	No prerequisites.
Contact time	40 Contact hours
Language of tuition	Module is presented in English
Department	Civil Engineering
Period of presentation	Year

Module content

A research term paper will be prepared.

The focus in this course will be on the practical aspects of pipeline design. The theoretical background to pipeline hydraulics will be covered and practical examples will be assessed. The following specific aspects such as pipeline hydraulics included dynamic pressures, pipeline component selection and design, pipeline installation and the testing and operation of pipelines will be covered in this course.

Applied statistical methods and optimisation 798 (SHC 798)

Module credits	24.00
NQF Level	08
Prerequisites	No prerequisites.
Contact time	40 Contact hours
Language of tuition	Module is presented in English
Department	Civil Engineering
Period of presentation	Year

Module content

A research term paper will be prepared.

The course will apply some of the basics theories and methodologies in statistics and operations research to solve common civil engineering problems. The course seeks to demonstrate the use and application in the civil engineering field. Each of the applications seeks to determine how best to design and operate a system, usually under conditions requiring the allocation of scarce resources. Emphasis will be on the applications of these methods in common civil engineering practice. Some of the applications will include; optimum network design, maximum flow problem, project scheduling, queuing theory, probabilistic analysis, Markov chain applications, etc.

Pump systems 785 (SHW 785)

Module credits	24.00
NQF Level	08
Prerequisites	No prerequisites.
Contact time	32 Contact hours
Language of tuition	Module is presented in English
Department	Civil Engineering
Period of presentation	Year

Module content

A research term paper will be prepared.

Numerical methods and finite element applications for Civil Engineers 790 (SIK 790)

Module credits	24.00
NQF Level	08
Contact time	40 contact hours
Language of tuition	Module is presented in English
Department	Civil Engineering
Period of presentation	Year

Module content

In the first part of this course, numerical procedures and some underlying theory for solving systems of equations, eigenvalue problems, integration, approximation and boundary value problems will be discussed. The second part of the course covers general finite element theory, discretization aspects related to geometry, nodes and numbering, element type and shape, interpolation functions, formulation of element characteristic matrices and vectors for elasticity problems, assembly and solution of the finite element equations, modelling procedures and results processing. The student will use Finite Element software to apply the theory that was covered in the course for solving typical Civil Engineering problems.

Civil research 780 (SSC 780)

Module credits	32.00
NQF Level	08
Contact time	8 contact hours per year
Language of tuition	Module is presented in English
Department	Civil Engineering
Period of presentation	Year

Module content

*This is a compulsory module.

The course will require all honours students to conduct research in an appropriate field of civil engineering, linked to the main discipline in which the student specializes for their honours degree.

Elective modules

Principles of environmental engineering 780 (CEM 780)

Module credits	32.00
NQF Level	08
Prerequisites	Admission to relevant programme.
Contact time	32 contact hours per semester
Language of tuition	Module is presented in English
Department	Chemical Engineering
Period of presentation	Semester 1

Module content

Engineering principles for environmental preservation and management, pollution control, life-cycle assessment, interactions in the macro and micro-environments, global and ecological systems, social-economic factors in environmental systems, predictive models for the current and future environment, environmental engineering as the driver of economic systems.

Concrete technology 794 (SGC 794)

Module credits	24.00
NQF Level	08
Prerequisites	No prerequisites.
Contact time	40 Contact hours
Language of tuition	Module is presented in English
Department	Civil Engineering
Period of presentation	Year

Module content

A research term paper will be prepared.

Properties of concrete and concrete mixes. Characteristics of Portland cement and supplementary cementitious materials. Aggregates, admixtures and practical design of mixes. Manufacture, curing and testing, including non-destructive methods. Statistical approach to quality control. Time-dependent behaviour and durability of concrete. The principles for appropriate selection of materials and techniques for repair, maintenance and strengthening of civil engineering structures. Investigation and diagnosis. Corrosion of reinforcement. Alkali-aggregate reaction, sulphate attack. Physical degradation. Repair materials. Protective systems. Systems for repair.

Hydraulic design 793 (SHC 793)

Module credits	24.00
NQF Level	08
Prerequisites	No prerequisites.
Contact time	32 Contact hours
Language of tuition	Module is presented in English
Department	Civil Engineering
Period of presentation	Year

Module content

A research term paper will be prepared.

This course covers the hydraulic aspects associated with the design of hydraulic structures for dams, road drainage, and other conveyance systems. The hydraulic considerations for the selection and design of energy dissipation structures are assessed in this course.

Water resource analysis and management 796 (SHC 796)

Module credits	24.00
NQF Level	08
Prerequisites	No prerequisites.
Contact time	32 Contact hours
Language of tuition	Module is presented in English
Department	Civil Engineering
Period of presentation	Year

Module content

A research term paper will be prepared.

In this course students will be familiarized with the background and procedures used in the creation of flow records and the use of the WRSM2005 model. Surface water systems will be analysed and gross yields will be determined. In the second part of the course the theory and procedures required for the yield determination of surface water resources will be discussed.

Infrastructure management 790 (SSI 790)

Module credits	24.00
NQF Level	08
Prerequisites	No prerequisites.
Contact time	40 Contact hours
Language of tuition	Module is presented in English
Department	Civil Engineering

Period of presentation	Year

Module content

A research term paper will be prepared.

This module will cover the following topics: Asset Management principles, Maintenance Management principles, Maintenance strategies and philosophies, Condition based Maintenance, Reliability Centred Maintenance (RCM), Resource Management, Maintenance Management Systems, Total Productive Maintenance (TPM) and Risk Management. Maintenance management of the following disciplines will be studied in detail: Road infrastructure, Railway infrastructure, Airport infrastructure, Buildings and other structures, Water resources and water supply.

Industrial waste engineering 780 (WAI 780)

Module credits	32.00
NQF Level	08
Prerequisites	Admission to relevant programme.
Contact time	32 contact hours per semester
Language of tuition	Module is presented in English
Department	Chemical Engineering
Period of presentation	Semester 1 or Semester 2

Module content

Identification of source materials, physical and chemical properties of waste. Release and transport mechanisms from source to air, groundwater, soil. Primary pathways of contaminants including sorption, volatilisation, biotic and abiotic transformations. Toxicology: absorption, distribution, biochemical transformation, and secretion of chemicals. Acute and chronic toxicity quantification and evaluation of risk. Hazard identification, exposure assessment, toxicity assessment and risk characterisation. Minimum requirements for the handling, classification and disposal of hazardous waste. Minimum requirements for waste disposal by landfill. Minimum requirements for water monitoring at waste management facilities. Recycling and resource management. Waste prevention, minimisation and optimisation.

Biological water treatment 780 (WBW 780)

Module credits	32.00
NQF Level	08
Prerequisites	Admission to relevant programme.
Contact time	32 contact hours per semester
Language of tuition	Module is presented in English
Department	Chemical Engineering
Period of presentation	Semester 2

Chemical water treatment 780 (WCW 780)

Module credits	32.00

NQF Level	08
Prerequisites	Admission to relevant programme.
Contact time	32 contact hours per semester
Language of tuition	Module is presented in English
Department	Chemical Engineering
Period of presentation	Semester 1

Water quality management and research 780 (WQB 780)

Module credits	32.00
NQF Level	08
Prerequisites	Admission to relevant programme.
Contact time	32 contact hours per semester
Language of tuition	Module is presented in English
Department	Chemical Engineering
Period of presentation	Semester 1 or Semester 2

General Academic Regulations and Student Rules

The General Academic Regulations (G Regulations) and General Student Rules apply to all faculties and registered students of the University, as well as all prospective students who have accepted an offer of a place at the University of Pretoria. On registering for a programme, the student bears the responsibility of ensuring that they familiarise themselves with the General Academic Regulations applicable to their registration, as well as the relevant faculty-specific and programme-specific regulations and information as stipulated in the relevant yearbook. Ignorance concerning these regulations will not be accepted as an excuse for any transgression, or basis for an exception to any of the aforementioned regulations. The G Regulations are updated annually and may be amended after the publication of this information.

Regulations, degree requirements and information

The faculty regulations, information on and requirements for the degrees published here are subject to change and may be amended after the publication of this information.

University of Pretoria Programme Qualification Mix (PQM) verification project

The higher education sector has undergone an extensive alignment to the Higher Education Qualification Sub-Framework (HEQSF) across all institutions in South Africa. In order to comply with the HEQSF, all institutions are legally required to participate in a national initiative led by regulatory bodies such as the Department of Higher Education and Training (DHET), the Council on Higher Education (CHE), and the South African Qualifications Authority (SAQA). The University of Pretoria is presently engaged in an ongoing effort to align its qualifications and programmes with the HEQSF criteria. Current and prospective students should take note that changes to UP qualification and programme names, may occur as a result of the HEQSF initiative. Students are advised to

contact their faculties if they have any questions.