Research Administrative Staff  
W van der Ross  
G Verster  

Finance Assistant  
A Courie  

Senior Secretary  
C Wright  

Receptionist  
Z Mcoteli  

Laboratory Technical Staff  
L Adams  
H Mafungwa  
C May  
E Witbooi  

Workshop Assistant  
M Swayiza  

Postgraduate Programmes  

Master's Programmes  

Master of Science in Engineering specialising in Civil Engineering  

The Department of Civil Engineering prepares candidates for the Master of Science in Engineering. Masters degree programmes are offered which comprise different levels of research versus course work, thus allowing students to educate themselves according to their particular strengths and career choices. The majority of courses are block week and cover a variety of topics. The Master of Science in Engineering can be either by dissertation only [EM023] or by coursework (approved by your supervisor) and dissertation [EM024].  

EM023 Research Master's by dissertation  
[EM023CIV01]  
Core Course  

<table>
<thead>
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<th>Course</th>
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EM024 Research Master's by coursework and dissertation  
[EM024CIV01]  
Core Courses  

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Civil Infrastructure Management and Maintenance [CIV07]

Professor and Programme Convener:
H Beushausen, Dipl-Ing HAW Hamburg MSc(Eng) PhD Cape Town

The primary aim of the MEng and MSc(Eng) specialising in Civil Infrastructure Management & Maintenance is to produce graduates with the necessary knowledge and skills to engage effectively in structural and materials engineering with respect to maintenance, rehabilitation and management of civil infrastructure. The broad areas of interest are deterioration science, assessment technologies, renewal engineering and project management.

All programmes can be completed in a minimum of two years full-time or may be taken over an extended period of a maximum of five years.

Master of Engineering specialising in Civil Infrastructure Management and Maintenance [EM017CIV07]

Core Courses

<table>
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<th>Course</th>
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Elective Courses

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<td>Safety of Special Structures</td>
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<td>CIV5119Z</td>
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Master of Science in Engineering specialising in Civil Infrastructure Management and Maintenance [EM023CIV07]

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### Master of Science in Engineering specialising in Civil Infrastructure Management & Maintenance

**[EM024CIV07]**

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**Elective Courses (minimum of 20 credits)**

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### Master of Science in Engineering specialising in Geotechnical Engineering

**[EM024CIV08]**

**Associate Professor and Programme Convener:**

D Kalumba, BSc(Eng) Makerere MSc(Eng) Cape Town PhD Newcastle-upon-Tyne

The master’s programme with a specialisation in Geotechnical Engineering is intended to support high level training and enhance both the technical skills of recent graduates or experienced personnel who work in, or aspire to a career in civil engineering construction, consulting, environmental and related industries.

**Core Courses**

<table>
<thead>
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<td>CIV5110Z</td>
<td>Laboratory and Field Techniques</td>
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<td>CIV5114Z</td>
<td>Foundation Design</td>
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<td>CIV5122Z</td>
<td>Advanced Soil Mechanics</td>
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**Elective Courses (minimum of 12 credits)**

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<td>Ground Improvement Techniques</td>
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<td>9</td>
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<td>CIV5123Z</td>
<td>Contaminated Land and Remediation</td>
<td>16</td>
<td>9</td>
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<tr>
<td>CIV5124Z</td>
<td>Geosynthetics Engineering</td>
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<tr>
<td>CIV5125Z</td>
<td>Lateral Earth Supports</td>
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<td>9</td>
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<tr>
<td>CIV5126Z</td>
<td>Slope Stability</td>
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<tr>
<td>CIV5143Z</td>
<td>Rock Mechanics</td>
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**Enrichment courses (compulsory for MScEng)**

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</table>
Master of Geotechnical Engineering  
[EM028CIV08]

Associate Professor and Programme Convener:  
D Kalumba, BSc(Eng) Makerere MSc(Eng) Cape Town PhD Newcastle-upon-Tyne

The Master of Geotechnical Engineering (MGeotech) programme is designed to aid in the development of graduates in their careers as geotechnical engineers through courses that offer-in-depth understanding of the principles of geotechnical engineering as well as the necessary knowledge and skills to engage effectively in providing solutions to engineering challenges involving the ground control and ground stability in civil engineering construction projects.

### Core Courses

<table>
<thead>
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<th>Course</th>
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<td>Laboratory and Field Techniques</td>
<td>16</td>
<td>9</td>
</tr>
<tr>
<td>CIV5114Z</td>
<td>Foundation Design</td>
<td>16</td>
<td>9</td>
</tr>
<tr>
<td>CIV5125Z</td>
<td>Lateral Earth Supports</td>
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### Elective Courses (minimum of 87 credits)

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<tr>
<td>CIV5122Z</td>
<td>Advanced Soil Mechanics</td>
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<td>Contaminated Land and Remediation</td>
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Structural Engineering and Materials

### Structural Engineering and Materials

Associate Professor and Programme Convener:  
S Skatulla Dipl-Ing Karlsruhe PhD Adelaide

The programme offers high level training in structural design, structural analysis and structural materials by providing sound theoretical background and encouraging critical and innovative thinking. Students benefit from expertise in concrete technology, concrete durability, structural performance and design, computational mechanics and finite element analysis. The programme is supported by excellent laboratory and computing facilities and draws from cutting edge research including the in-house developed structural analysis software SESKA.

All programmes can be completed in a minimum of two years full-time or may be taken over an extended period of a maximum of five years.

Master of Engineering specialising in Structural Engineering and Materials  
[EM017CIV04]

A candidate for the MEng in Structural Engineering and Materials [EM017CIV04] is required to complete 120 credits coursework and a 60 credit minor dissertation.
### Core Courses

<table>
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<tr>
<td>CIV5100Z</td>
<td>Plate and Shell Structures</td>
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<td>CIV5142Z</td>
<td>Introduction to Finite Element Modelling in Structural Analysis</td>
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### Elective Courses (minimum of 72 credits)

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<td>CIV5006Z</td>
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<td>Bridge Analysis and Design</td>
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<td>CIV5108Z</td>
<td>Advanced Mechanics of Materials</td>
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<td>9</td>
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<td>CIV5112Z</td>
<td>Stability and Design of Steel Structures</td>
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<td>Structural Performance Assessment &amp; Monitoring</td>
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<td>Repair and Rehabilitation of Concrete Structures</td>
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### Master of Science in Engineering specialising in Structural Engineering and Materials

[EM024CIV04]

A candidate for the MSc Eng [EM024] is required to complete prescribed courses of a minimum value of 60 credits and a 120 credit dissertation.

### Core Courses

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Select at least two of the following courses:

### Elective Courses

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<td>An introduction to Finite Elements</td>
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### Enrichment Courses

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</table>
Additional courses can be selected from the postgraduate programme of the University of Stellenbosch or from the Center for Research in Computational and Applied Mechanics (CERECAM) at UCT or from the postgraduate programme of Geotechnical Engineering for both the MScEng and MEng degrees.

**Transport Studies**

**Associate Professor and Programme Convener:**
R Behrens, Pr Pln BA MCRP PhD *Cape Town*

The programme offers degrees specialising in transport studies, with a specific focus on the planning and management of urban passenger transport systems. The primary aim is to produce graduates from a range of postgraduate disciplines with the necessary knowledge and skills to engage effectively with the challenge of creating affordable, efficient, sustainable, safe, equitable and environmentally sound urban transport systems, and to contribute to the implementation of new and demanding policy directives. Curriculum content is cross-disciplinary in orientation and exposes students to a broad range of the analytical, evaluative, planning and management issues they are likely to encounter in the field.

**Master of Engineering specialising in Transport Studies**

**[EM017CIV06]**

A candidate for the MEng in Transport Studies is required to complete core courses totalling 120 credits (including a 60 credit minor dissertation) plus approved elective courses totalling a minimum of 60 credits, and to comply with the prescribed curriculum. Candidate elective courses may be selected from within the Transport Studies programme and from other programmes of study.

<table>
<thead>
<tr>
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<th>Code</th>
<th>Course</th>
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<td>CIV5071Z</td>
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**Master of Philosophy specialising in Transport Studies**

**[EM026CIV06]**

A candidate for the MPhil degree is required to complete prescribed courses of a minimum value of 60 credits and a 120 credit dissertation.

<table>
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<th>Code</th>
<th>Course</th>
<th>NQF Credits</th>
<th>HEQSF Level</th>
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<td>CIV5038Z</td>
<td>Integrated Land Use Transportation Planning</td>
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<td>CIV5036Z</td>
<td>Local Area Transport Planning Management and Design</td>
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<td>Non-motorised Transportation</td>
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DEPARTMENTS IN THE FACULTY AND COURSES OFFERED  131

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<tr>
<td>CIV5070Z</td>
<td>Public Transport Policy and Regulation</td>
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<td>CIV5071Z</td>
<td>Public Transport System Design and Operations Management</td>
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<td>END5127Z</td>
<td>Discrete Choice Modelling and Stated Choice Survey Design</td>
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Total credits................................................................................. 180

Students are also eligible to complete the MPhil degree as a 180 credit dissertation.

**Master of Philosophy specialising in Transport Studies**

[EM027CIV06]

A candidate for the MPhil in Transport Studies is required to complete core courses totalling 120 credits (including a 60 credit minor dissertation) plus approved elective courses totalling a minimum of 60 credits, and to comply with the prescribed curriculum.

Core Courses

<table>
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<td>CIV5035Z</td>
<td>Management of Transport Supply and Demand</td>
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<td>CIV5038Z</td>
<td>Integrated Land Use-Transport Planning</td>
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<td>CIV5132Z</td>
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Total credits................................................................................. 180

Elective Courses (minimum of 60 credits)

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<td>CIV5039Z</td>
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<tr>
<td>CIV5133Z</td>
<td>Transport Modelling</td>
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<td>CIV5070Z</td>
<td>Public Transport Policy and Regulation</td>
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<td>CIV5071Z</td>
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<td>END5127Z</td>
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**Master of Transport Studies**

[EM029CIV06]

A candidate for the Master of Transport Studies is required to complete core courses totalling not less than 60 credits, approved elective courses totalling a minimum of 80 credits, research projects totalling a minimum of 50 credits, and to comply with the prescribed curriculum.

Core Courses

<table>
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<tr>
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Total credits................................................................................. 190

Elective Courses (minimum of 80 credits)

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Code | Course | NQF Credits | HEQSF Level
--- | --- | --- | ---
CIV5133Z | Transport Modelling | 20 | 9
CIV5070Z | Public Transport Policy and Regulation | 20 | 9
CIV5071Z | Public Transport System Design and Operations Management | 20 | 9
END5127Z | Choice Modelling and Stated Choice Survey Design | 20 | 9

**Urban Infrastructure Design & Management**

**Professor and Programme Convener:**
P Moyo, PrEng BSc(Eng) Zimbabwe MSc(Eng) Newcastle-upon-Tyne PhD Nanyang MSAICE MIABSE

The primary aim of the MPhil specialising in Urban Infrastructure Design and Management is to produce graduates with the necessary knowledge and skills to engage effectively with infrastructure design and management in developing cities. Topics include: Issues and strategies; community development, urban renewal, sustainable urban systems, advanced infrastructure management and information technology and other planning and management topics.

*The programme is closed to new applicants. Students currently registered for the programme are permitted to continue provided they have completed all the coursework requirements, and are currently registered for their dissertation/minor dissertation.*

**Master of Philosophy specialising in Urban Infrastructure Design & Management [EM027CIV03]**

Topics for CIV5037Z: Minor Dissertation will be restricted to the fields of interest of the academic staff linked to this programme. For more information, contact the Postgraduate Programme Administrator Ms Rowen Geswindt or the Programme Convener.

**Core Courses**

<table>
<thead>
<tr>
<th>Code</th>
<th>Course</th>
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<td>Minor Dissertation</td>
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**Elective Courses (select 40 credits)**

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<td>Integrated Urban Water Management</td>
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<td>CON5016Z</td>
<td>Project Implementation and Management</td>
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<td>Local Area Transport Planning, Management &amp; Design</td>
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**Master of Philosophy specialising in Urban Infrastructure Design & Management [EM026CIV03]**

**Core Courses**

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DEPARTMENTS IN THE FACULTY AND COURSES OFFERED

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<td>CIV5038Z</td>
<td>Integrated Land-Use &amp; Transport Planning</td>
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**Water Quality Engineering**

**Senior Lecturer and Programme Convener:**

DS Ikumi, PhD *Cape Town*

The primary aim of the MEng and MScEng specialising in Water Quality Engineering is to produce graduates with the necessary knowledge and skills to engage effectively in theory, design, modelling and operation Waste Water Treatment, Urban Water and Water Distribution.

**Master of Engineering specialising in Water Quality Engineering**

**[EM017CIV02]**

**Core Courses**

<table>
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<td>Sewage Sludge Treatment</td>
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<tr>
<td>CIV5048Z</td>
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**Elective Courses (select 50 credits)**

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<td>CIV5051Z</td>
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<td>Aquatic Chemistry Part B</td>
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<tr>
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**Master of Science in Engineering specialising in Water Quality Engineering**

**[EM023CIV02]**

**Core Courses**

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**Master of Science in Engineering specialising in Water Quality Engineering [EM024CIV02]**

### Core Courses

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<td>CIV5109Z</td>
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<td>END5050X</td>
<td>Master’s journal paper ...........................</td>
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<td>CIV5045Z</td>
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<td>CIV5046Z</td>
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### Elective Courses

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**Doctoral Programmes**

### Doctor of Philosophy [ED001CIV01]

<table>
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Course descriptions are set out in the section Courses Offered. The course code abbreviation for Civil Engineering is CIV.

**Course Outlines**

**CIV5000W**  MASTERS IN CIVIL ENGINEERING DISSERTATION

180 NQF credits at HEQSF level 9

**Course outline:**

The dissertation should incorporate any or all of the following: design of all or part of an engineering project to a specification involving advanced concepts and theoretical principles; a research project of a theoretical or practical nature; a critical review of a specified topic based upon a comprehensive search of the literature or available data; development of an item of equipment or a technique involving novel features or advanced design; or any other study acceptable to the Faculty.

**DP requirements:** None

**Assessment:** Written work counts 100%.
CIV5000Z  MASTERS IN CIVIL ENG - DISSERT PART
120 NQF credits at HEQSF level 9
Course entry requirements: CIV5109Z
Course outline:
The dissertation should incorporate any or all of the following: design of all or part of an engineering project to a specification involving advanced concepts and theoretical principles; a research project of a theoretical or practical nature; a critical review of a specified topic based upon a comprehensive search of the literature or available data, development of an item of equipment or a technique involving novel features; or advanced design, or any other study acceptable to the Faculty.
DP requirements: None
Assessment: Written work counts 100%.

CIV5002Z  STRUCTURAL CONCRETE PROPERTIES & PRACTICE
16 NQF credits at HEQSF level 9
Convener: Professor H Beushausen
Course entry requirements: BScEng
Course outline:
The aims of the course are to provide structural engineers with fundamental and practical knowledge in concrete materials technology, to establish an understanding on modelling and designing concrete properties relevant to structural design, and to create awareness on chemical and physical material characteristics of cementitious construction materials. The topics covered in this course include: constituent materials (cements, admixtures, cement extenders, aggregates); desirable properties for concrete (plastic and hardened properties, including strength, creep, shrinkage, elastic modulus, durability); concrete mix design; prediction and modelling of concrete structural properties; concrete failure and fracture; concrete quality control; deterioration mechanisms; special concretes such as high strength concrete, self compacting concrete and fibre reinforced concrete. The course includes lectures, industrial visits, seminars, projects, and laboratory sessions.
Lecture times: 40 hours (1 week block lectures)
DP requirements: Attendance of lectures and practicals; submission of assignments and project reports.
Assessment: Research paper 15%, research oral presentation 10%, laboratory report 15%, final examination 60% (closed book).

CIV5006Z  ADVANCED STRUCTURAL CONCRETE ENGINEERING
Not offered in 2018
16 NQF credits at HEQSF level 9
Convener: Professor H Beushausen
Course entry requirements: BScEng; CIV3049S (or equivalent), CIV4045F (or equivalent)
Course outline:
The aims of this course are to provide structural engineers with an understanding of structural failure mechanisms of reinforced concrete slabs, to present analysis and design methods for reinforced concrete slabs at the ultimate limit state, and to introduce design principles for composite concrete-to-concrete structures. The course contents include: yield line analysis and design of reinforced concrete slabs (yield line patterns, failure mechanisms, internal and external work done, detection of the critical bending moment, unusual slab geometries, optimization of reinforcement arrangements, etc.); Hillerborg strip method of analysis and design of concrete slabs (principles and theory of analysis and design, design optimization, bending moment redistribution, optimization of reinforcement layout); and composite structural systems (ultimate limit state analysis and design principles, practical considerations).
DP requirements: Attendance of lectures, an average assignment mark of 50%.
Assessment: Assignments 40%, final exam 60% (closed book).
CIV5017Z  MINOR DISSERTATION
60 NQF credits at HEQSF level 9
Convener: As per programme requirement
Course entry requirements: Core MEng courses to be completed
Course outline:
Candidates will undertake a project of a development, review, or practical nature on a prescribed Civil Engineering topic. The project may be undertaken individually or as a group project and a project report must be written. The project will require approximately 600 hours of work.
DP requirements: None
Assessment: Written work 100%.

CIV5025F  CONTRACT LAW
Not offered in 2018
12 NQF credits at HEQSF level 9
Convener: Professor H Beushausen
Course entry requirements: Suitable undergraduate degree
Course outline:
The course aims to review the Law of Contract to develop a framework for the analysis of standard documentation for both main and subsidiary civil engineering contracts. Important aspects of mediation, arbitration and court procedures are stressed as is the need to identify and resolve legal problems through timeous negotiation. Disputes which have gone to law or arbitration will be studied to illustrate principles.
DP requirements: None
Assessment: Assignments 50%, final examination 50%.

CIV5030Z  CIVIL ENGINEERING PROJECT
20 NQF credits at HEQSF level 9
Convener: As per programme requirement
Course entry requirements: Completion of appropriate postgraduate courses.
Course outline:
On the recommendation of the supervisor and with the agreement of the Head of Department, a student registered for an MSc(Eng) may be permitted to enter into a programme of individual study on a specialised topic. A statement of objectives must be agreed upon, and the course of study will be guided by the supervisor. The programme will involve the student in about 200 hours of work, and a written report must be submitted. The written report will be examined, and a further oral examination may be held.
Details of project topics are available from the Department.
DP requirements: None
Assessment: Written project 100%.

CIV5032Z  PRINCIPLES OF WASTEWATER TREATMENT & WASTEWATER CHARACTERISATION
4 NQF credits at HEQSF level 9
Convener: Dr D Ikumi
Course outline:
This advanced course on the principles of wastewater treatment and wastewater characterisation includes: objectives of wastewater treatment; wastewater chemical and physical characterization; measurement of energy, nitrogen and phosphorus in municipal wastewater; effect of settlement and filtration. Also covered are: characterisation of primary sludge for anaerobic digestion, and an overview of unit operations in wastewater treatment.
DP requirements: None
Assessment: Examination 100%.
CIV5035Z MANAGEMENT OF TRANSPORT SUPPLY AND DEMAND
20 NQF credits at HEQSF level 9
Convener: Associate Professor R Behrens
Course outline:
This course aims to develop an advanced understanding of transport systems management. Topics include: the rationale for the management of transport systems through alternatives to large scale infrastructure provision; transport impact assessment and access management as a means of managing the impacts of new land use development on transport systems; ‘road space management’ as a means of prioritising public transport vehicles; ‘transport system management’ as a means of managing transport supply; ‘travel demand management’ as a means of managing travel behaviour; and the use of ‘intelligent transport systems' in supply and demand management.
DP requirements: None
Assessment: Preparatory Assignments 15%; group assignment 10%; major assignment 50% and course test 25%.

CIV5036Z LOCAL AREA TRANSPORT PLANNING, MANAGEMENT AND DESIGN
Not offered in 2018
20 NQF credits at HEQSF level 9
Convener: Associate Professor R Behrens
Course outline:
This advanced course in local area transport planning, management and design includes: the planning and implementation of transport improvements at a local area (as opposed to citywide) scale; urban design, landscaping and geometric design of streets; the design and management of local area movement networks; and accommodating pedestrians, bicycles and persons with movement disabilities in local area movement networks.
DP requirements: None
Assessment: Preparatory Assignments 15%; group assignment 10%; major assignment 50% and course test 25%.

CIV5037Z MINOR DISSERTATION
60 NQF credits at HEQSF level 9
Course outline:
This minor dissertation course includes the selection of an approved research problem/topic; the preparation of research project/proposal; conducting a literature review; conducting research, including information/data acquisition and analysis, and the preparation of minor dissertation for examination (a word length of 15 000 words should not normally be exceeded). The project will require approximately 600 hours of work.

CIV5038Z INTEGRATED LAND USE TRANSPORT PLANNING
20 NQF credits at HEQSF level 9
Convener: Associate Professor R Behrens
Course outline:
This course aims to develop an advanced understanding of the integration of land use planning and transport planning process. Topics include: theoretical perspectives on the relationship between transport systems and urban activity systems; co-evolution of transport systems and urban form; sustainable transport and the problem of ‘automobile dependent' cities; planning paradigms and rationales for public intervention into land use and transport systems; legislative, institutional and financial frameworks for land use and transport planning in South Africa; conceptual framing and practical application of approaches to integrated land use-transport planning in the South African context and local and international case studies and experiences.
DP requirements: None
Assessment: Preparatory Assignments 15%; group assignment 10%; major assignment 50% and course test 25%.

CIV5039Z  NON-MOTORISED TRANSPORTATION
20 NQF credits at HEQSF level 9
Convener: Associate Professor M Vanderschuren

Course outline:
This course aims to develop an advanced understanding of planning and design of non-motorised transportation infrastructure. Topics include: current South African realities and the importance of non-motorised travel modes; planning frameworks for non-motorised transportation infrastructure improvements and network management; methods of site and network analysis, and approaches to modelling and simulation; footway and pathway design; the design of pedestrian precincts; low-cost bicycle supply and promotion; cycleway and bicycle parking design and pedestrian and bicycle crossing facilities.

DP requirements: None
Assessment: Preparatory Assignments 15%; group assignment 10%; major assignment 50% and course test 25%.

CIV5040W  MASTERS DISSERTATION: TRANSPORT STUDIES
180 NQF credits at HEQSF level 9
Convener: As per programme requirement.

Course outline:
The dissertation should incorporate any or all of the following: a research project of a theoretical or practical nature; a critical review of a specified topic based upon a comprehensive search of the literature or available data; development of an item of equipment or a technique involving novel features or advanced design; or any other study acceptable to the Faculty.

DP requirements: None
Assessment: 100% written work.

CIV5041Z  BRIDGE ANALYSIS & DESIGN
16 NQF credits at HEQSF level 9
Convener: Professor H Beushausen
Course entry requirements: BScEng

Course outline:
This course aims to develop an advanced understanding of conceptual and structural analysis and design of concrete bridges. Topics include: conceptual design of bridges (design objectives and basis of design, design procedures, examples of good design, load bearing systems); preliminary structural design (load models, normative guidelines, analytical models); modelling of concrete bridges (typical finite element models, movable loads, dynamic loading); construction technology (principles and application of various construction methods); prestressing of concrete bridges (design principles, tendon layouts, methods of prestressing, prestress losses, etc.); concrete technology aspects (suitable concrete types, special design requirements for bridges, durability aspects); structural condition assessment (principles of non-destructive dynamic testing and verification of load-bearing capacity).

DP requirements: Attendance of lectures and practicals, submission of assignments and project reports.
Assessment: Assignments and projects 50%, final examination 50%.

CIV5045Z  THE ACTIVATED SLUDGE SYSTEM
10 NQF credits at HEQSF level 9
Convener: Dr D Ikumi
Course entry requirements: CIV5032Z
Course outline:
This course aims to develop an advanced understanding of the activated sludge system. Topics include: biological process modelling of the activated sludge system including nitrification; material mass balances; reactor kinetics; biological process kinetic equations of ordinary heterotrophic organism and autotrophic nitrifier organism growth and endogenous respiration; development of the steady state activated sludge model; application to design, selection of sludge age, impact of primary settling, sewage sludge disposal. Aeration is also covered.

DP requirements: None
Assessment: Examination 100%

CIV5046Z  SEDIMENTATION IN WATER & WASTEWATER TREATMENT
8 NQF credits at HEQSF level 9
Convener: Dr D Ikumi
Course entry requirements: CIV5032Z

Course outline:
This advanced course in sedimentation in water and wastewater treatment includes: classes of settling; factors affecting settling tanks; column test for water-treatment solids settling characterization; application to sizing settling tanks (classes 1 and 2 settling); effect of flocculation; flux theory and application to sizing wastewater treatment plant settling tanks (classes 3 and 4); measures of activated sludge settleability and relationships between them; comparison of flux theory with other design procedures; and computational fluid dynamics modelling of settling tanks.

DP requirements: None
Assessment: Examination 100%

CIV5047Z  SEWAGE SLUDGE TREATMENT
8 NQF credits at HEQSF level 9
Convener: Dr D Ikumi
Course entry requirements: CIV5032Z, CIV5046Z

Course outline:
This advanced course in sewage sludge treatment includes: an introduction to sewage sludge reuse and disposal guidelines in South Africa; characterization of primary and waste activated sludge in the context of mass balances over the entire wastewater treatment plant; sludge thickening with gravity sedimentation and flotation; development and validation of steady state aerobic digestion model for primary and waste activated sludge stabilisation and application to design and analysis including oxygen transfer and sludge thickening considerations; kinetics, stoichiometry and weak acid/base chemistry of anaerobic digestion; development, validation and application of steady state anaerobic digestion model, generation of sludge treatment liquors and the impact of their recirculation on effluent quality, and nutrient (N and P) reduction in sludge treatment liquors.

DP requirements: None
Assessment: Examination 100%

CIV5048Z  STEADY STATE DESIGN OF BIOLOGICAL NUTRIENT REMOVAL SYSTEMS
20 NQF credits at HEQSF level 9
Convener: Dr D Ikumi
Course entry requirements: CIV5045Z

Course outline:
This advanced course in steady state design of biological nutrient removal systems includes: ensuring nitrification; nitrification capacity, kinetics of denitrification, development of the steady state nitrification denitrification (ND) model; effect of ND on reactor volume, effluent alkalinity and oxygen demand; the role of readily biodegradable (RB) and slowly biodegradable (SB) organics; denitrification potential; effect of the influent TKN/COD ratio on unaerated mass fraction, N removal and effluent quality; calculation of inter-reactor recycles ratios for design and analysis of
DEPARTMENTS IN THE FACULTY AND COURSES OFFERED

pre-, post- and combined denitrification systems. Characteristics of polyphosphate accumulating organisms (PAOs); development and use of biological excess phosphorus removal (BEPR) steady state model; design and analysis of NDBEPR of systems, chemical P precipitation and its effect on BEPR; novel applications; the impact of membrane solid/liquid separation and external nitrification on NDBEPR system design.

**DP requirements:** None
**Assessment:** Examination 100%

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**CIV5049Z** MODELLING & SIMULATION OF WASTEWATER TREATMENT SYSTEMS

*Not offered in 2018*
12 NQF credits at HEQSF level 9

**Convener:** Dr Ikumi

**Course entry requirements:** CIV5048Z

**Course outline:**
This advanced course in the modelling and simulation of wastewater treatment systems includes: kinetics of the readily biodegradable (RBCOD) and slowly biodegradable (SBCOD) organics utilization by ordinary heterotrophic organisms (OHOs), nitrification by autotrophic nitrifying organisms (ANOs) in aerobic systems; modifications for application to anoxic-aerobic systems; kinetics of RBCOD conversion to short chain fatty acids (SCFA) in the anaerobic reactor, kinetics of SCFA uptake, P release and substrate storage under anaerobic conditions and substrate utilisation (growth) and P uptake and aerobic conditions by PAO's; model presentation in Petersen matrix format; links to and simplifications of kinetics for steady state BNR models; programming, modelling and simulation of BNR activated sludge systems with the pre-coded UCTOLD and UCTPHO programmes and the ASIM or AQUASIM shell packages. Filamentous organism type and identification, control by means of kinetic and metabolic selection; and causes and control of filamentous organism proliferation in BNR systems.

**DP requirements:** None
**Assessment:** Examination 100%

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**CIV5050Z** INTEGRATED WASTEWATER TREATMENT PLANT DESIGN

20 NQF credits at HEQSF level 9

**Convener:** Dr D Ikumi

**Course entry requirements:** CIV5045Z, CIV5046Z, CIV5047Z

**Course outline:**
This advanced course in integrated wastewater treatment plant design includes: calculating daily composite average flow and loads from diurnal data; influent flow balancing; integrated wastewater treatment plant modelling and design; major project brief; economic evaluation of different wastewater treatment plant layouts to achieve different technical, and environmental and economic objectives.

**DP requirements:** None
**Assessment:** Major project 100%

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**CIV5051Z** AQUATIC CHEMISTRY PART A

*Not offered in 2018*
14 NQF credits at HEQSF level 9

**Convener:** Dr D Ikumi

**Course entry requirements:** None

**Course outline:**
This advanced course in aquatic chemistry covers: chemical thermodynamics; acids and bases, activity, pH equilibria of weak acid base systems, master variable diagrams, titration of acids and bases, reference species; alkalinity acidity and pH, buffering intensity, detailed treatment of the
carbonate system; precipitation and dissolution, Caldwell-Lawrence conditioning diagrams, critical evaluation of the Langelier index; and terrestrial and ground water stabilization.

**DP requirements:** None  
**Assessment:** Examination 100%.

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**CIV5052Z  AQUATIC CHEMISTRY PART B**

*Not offered in 2018*

14 NQF credits at HEQSF level 9  
**Convenor:** Dr D Ikumi  
**Course entry requirements:** CIV5051Z  
**Course outline:** This advanced course in aquatic chemistry covers: mixed weak acid systems; alkalinity, acidity and Deffeyes types single aqueous phase diagrams; application to pH control in anaerobic digester; the nitrogen and sulphur systems; Kinetics of precipitation reactions; redox equilibrium systems; Pourbaix (pe-pH) diagrams; application to the chemistry of iron, manganese, lead, chlorine and nitrates in treated and wastewaters; kinetics of redox reactions; and applications to physico-chemical treatment processes.

**DP requirements:** None  
**Assessment:** Examination 100%.

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**CIV5054Z  ADVANCED CHEMICAL, PHYSICAL & BIOLOGICAL PROCESSES MODELLING**

*Not offered in 2018*

10 NQF credits at HEQSF level 9  
**Convenor:** Dr D Ikumi  
**Course entry requirements:** CIV5049Z, CIV5051Z, CIV5052Z  
**Course outline:** This advanced course in chemical, physical and biological processes modelling includes: aqueous mixed weak acid base chemistry of the carbonate, phosphate, ammonia, short chain fatty acid and sulphur systems; kinetics of gas evolution and stripping; modelling multiple mineral precipitation in 3 phases such as in mineral precipitation in anaerobic digester liquor aeration; integrated chemical, physical and biological processes modelling of activated sludge and anaerobic digestion; modelling acidogenic, methanogenic and sulphidogenic systems.

**DP requirements:** None  
**Assessment:** Examination 100%.

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**CIV5064Z  URBAN TRANSITIONS IN THE GLOBAL SOUTH**

*Not offered in 2018*

20 NQF credits at HEQSF level 9  
**Convenor:** Professor E Pieterse  
**Course entry requirements:** Any suitable four-year degree  
**Course outline:** The aim of this course is to provide students with a wide-ranging introduction to the dynamics of differential urbanization processes in the global South with an eye on understanding the role of infrastructure in advancing more sustainable urban forms and patterns. The overarching learning objectives of the module are to understand the nature, drivers and consequences of the second urban transition from a sustainability perspective, as well as to make connections between urbanisation and long-term sustainability outcomes in different contexts, settings and scales. Topics covered include problems and issues of developing cities, poverty, exclusion, informality, livelihoods, economic development, governance and infrastructure.

**Lecture times:** 40 hours (1 week block lectures)  
**DP requirements:** Complete all assignments.  
**Assessment:** Coursework 35%, take home paper 65%.
CIV5070Z  PUBLIC TRANSPORT POLICY AND REGULATION
20 NQF credits at HEQSF level 9
Convener: Associate Professor R Behrens
Course entry requirements: None
Course outline:
This course aims to develop an understanding of public passenger transport system policy analysis and regulation. Topics include: Legislative and planning frameworks: institutional, legislative, financing and planning frameworks for integrated public transport infrastructure provision and service operation. Public transport policy: policy debates on subsidisation and competition regulation; mode alternatives analysis; international case studies of public transport system reform. Paratransit reform: operator consolidation and transition; fleet renewal; service upgrade; integration with scheduled services. Public transport system regulation and competition: industry structures; approaches to regulation and competition; licensing and contracting. Quality of service: quality-of-service measurement; passenger satisfaction measurement; passenger information systems and wayfinding.
DP requirements: None
Assessment: Preparatory Assignments 15%; group assignment 10%; major assignment 50% and course test 25%.

CIV5071Z  PUBLIC TRANSPORT SYSTEM DESIGN AND MANAGEMENT
20 NQF credits at HEQSF level 9
Convener: Associate Professor M Zuidgeest
Course entry requirements: None
Course outline:
This course aims to develop an advanced understanding of public passenger transport system design and operations management. Topics include: Public transport system concepts: basic bus and rail system concepts; alternative technologies and operating characteristics. Public transport system design: route network planning; service planning; road and rail right-of-way design and vehicle prioritisation; signalling systems; station and interchange design; demand estimation; passenger capacity analysis. Public transport system operations management: service quality assessment, scheduling and rostering; train movement control systems; reliability, disruption and incident management; performance assessment; ridership measurement. Integrated fare structures: integrated ticketing systems; fare structures; fare setting. System maintenance: asset management; vehicle fleet and rolling stock maintenance and refurbishment. DP requirements: Students are required to pass class exercises during the course week.
DP requirements: None
Assessment: Preparatory Assignments 15%; group assignment 10%; major assignment 50% and course test 25%.

CIV5073W  TRANSPORT POLICY AND PLANNING CASE STUDY
25 NQF credits at HEQSF level 9
Convener: Associate Professor R Behrens
Course entry requirements: None
Course outline:
The aim of this course is to offer students an opportunity to undertake a case study research project in which they are able to develop or deepen skills in transport policy and planning processes. The research would involve undertaking a critical investigation of the requirement for, the process of preparing and implementing, the content and the impacts of a selected transport policy, plan, strategy or project.
DP requirements: None
Assessment: Project report 100%.
CIV5100Z  PLATE & SHELL STRUCTURES PART A
Not offered in 2018
16 NQF credits at HEQSF level 9
Convener: Professor A Zingoni
Course entry requirements: BScEng
Course outline:
This course aims to be a comprehensive treatment of plate and shell theories, and their application to the solution of various problems in structural engineering. Plate and Shell Structures part A will cover plates subjected to bending and twisting (slope, curvature, twist, bending moments, transverse shears and twisting moments); the derivation of the bending equation for transversally loaded plates (rectangular and polar co-ordinates), solutions for rectangular plates and circular plates, practical applications, introduction to shell structures; the membrane hypothesis for shells; the membrane theory of axisymmetrically loaded shells of revolution.

DP requirements: None
Assessment: Examination 100%.

CIV5104S  PLATE & SHELL STRUCTURES PART B
16 NQF credits at HEQSF level 9
Convener: Professor A Zingoni
Course entry requirements: CIV5100Z
Course outline:
This course aims to be a comprehensive treatment of plate and shell theories, and their application to the solution of various problems in structural engineering. Plate and Shell Structures I will cover plates subjected to bending and twisting (slope, curvature, twist, bending moments, transverse shears and twisting moments); the derivation of the bending equation for transversally loaded plates (rectangular and polar co-ordinates), solutions for rectangular plates and circular plates, practical applications, introduction to shell structures; the membrane hypothesis for shells; the membrane theory of axisymmetrically loaded shells of revolution.

DP requirements: None
Assessment: Examination 100%.

CIV5107Z  INTEGRATED URBAN WATER MANAGEMENT
20 NQF credits at HEQSF level 9
Convener: Professor NP Armitage
Course entry requirements: Any suitable four-year degree.
Course outline:
The aim of this course is to introduce students to integrated urban water management (IUWM). This includes: social imperatives; environmental considerations; politics and water service delivery. Planning for water in the City of Cape Town; servicing the informal settlements of Cape Town. Water supply: key considerations for water reticulation systems; water supply options; household management of water; water demand management; public health considerations. Sanitation: options; managing sanitation in informal settlements. Stormwater: managing stormwater in the City of Cape Town; rehabilitating urban rivers; groundwater issues; Sustainable Drainage Systems (SuDS); catchment litter management. Water Sensitive Urban Design (WSUD); water management systems; sustainability indicators.
Lecture times: 40 hours (1 week block lectures).
DP requirements: Complete all assignments.
Assessment: Oral presentations 20%, two major assignments 80%.

CIV5108Z  ADVANCED MECHANICS OF MATERIALS
16 NQF credits at HEQSF level 9
Convener: Associate Professor S Skatulla
Course entry requirements: BScEng or equivalent
Course outline:
This advanced course in the mechanics of materials aims to introduce students to the following topics: physical mechanisms of deformation of common construction materials; continuum mechanics and its main mathematical tool, tensor analysis; non-linear continuum material behaviour, including visco-elasticity, plasticity, and modelling; failure and fracture characteristics and modelling of these effects. An introduction to computational mechanics is also included.

DP requirements: 40% Subminimum in class tests.
Assessment: Examination 60%, coursework 40%.

CIV5109Z  DISSERTATION PREPARATION
Prerequisite for CIV5000Z and CIV5134W
0 NQF credits at HEQSF level 9
Convener: As per programme requirement.
Course outline:
The aim of this course is to allow a student to undertake preparatory work for the master’s dissertation. Work required includes literature searches and reviews; identification of the research problem, objectives and hypothesis; consideration of research methodology; planning for the active research phase; and ensuring that research infrastructure (e.g. apparatus etc.) is or will be in place. The student should maintain regular contact with his/her supervisor in order to show evidence of suitable progress towards these aims. The supervisor must indicate satisfactory fulfilment of the course aims prior to the student proceeding to the dissertation.

DP requirements: None
Assessment: None

CIV5110Z  LABORATORY & FIELD TECHNIQUES
Not offered in 2018
16 NQF credits at HEQSF level 9
Convener: Associate Professor D Kalumba
Course entry requirements: Suitable undergraduate degree qualification in an engineering, geosciences or geological field.

Course outline:
This course aims to develop an advanced understanding of laboratory and field techniques. Topics include: Laboratory methods: role and scope of laboratory tests; fundamentals of stress-strain and strength measurements; stresses, pore pressures and strains; transducers and control systems; practical applications. The theoretical and practical aspects of in situ tests in geotechnical engineering. Tests discussed include: dynamic cone penetrometer standard penetration test, field vane, piezocone, dilatometer, pressuremeter etc. Geophysical methods are also included. Emphasis on use of in situ test results for determining engineering properties of soil for design. Field instrumentation; settlement gauges; extensometers; inclinometers; piezometers; geotechnical data correlation charts; measurements of in-situ stresses and permeability’s; etc. are also covered.

Lecture times: 40 hours (1 week block lectures).

DP requirements: None
Assessment: 40% Coursework, project 60%.

CIV5111Z  GROUND IMPROVEMENT TECHNIQUES
Not offered in 2018
16 NQF credits at HEQSF level 9
Convener: Associate Professor D Kalumba
Course entry requirements: Suitable undergraduate degree qualification in an engineering, geosciences or geological field

Course outline:
This course aims to introduce participants to the concepts underpinning a range of ground improvements and soil remediation techniques and an appreciation of how these techniques are
applied in practice. It covers important design and construction aspects associated with ground improvement techniques including: mechanical methods (compaction, explosives, vibroflotation, vibroreplacement); hydraulic methods (groundwater lowering, preloading, electro-osmosis); physical/chemical methods (admixtures, grouting, freezing); and inclusions.

Lecture times: 40 hours (1 week block lectures)
DP requirements: None
Assessment: Course work 50%, Project 50%

**CIV5112Z  STABILITY & DESIGN OF STEEL STRUCTURES**
16 NQF credits at HEQSF level 9
Convener: Associate Professor S Skatulla
Course entry requirements: BScEng
Course outline:
This course aims to treat advanced topics in constructional steel work. The topics include elastic and inelastic buckling behaviour; plate buckling; non-linear instability behaviour of thin-walled structures, design for fatigue; design of steel-concrete composites, hybrid steel structures, steel connections plate girders, and the behaviour of steel structures under fire. Applications in industrial buildings and crane supporting structures are also addressed.
DP requirements: None
Assessment: Coursework 50%, examination 50%.

**CIV5113Z  STRUCTURAL DYNAMICS WITH APPLICATIONS**
16 NQF credits at HEQSF level 9
Convener: Professor P Moyo
Course entry requirements: BScEng
Course outline:
This course aims to introduce the concepts of structural dynamics and its applications in structural engineering. Topics covered include dynamic equilibrium of structures. Response of a single degree of freedom system to dynamic excitation: free vibration, harmonic loads, impulse loading and general loading Response of multi-degree-of-freedom systems. Free vibrations: mass, damping, and stiffness matrices. Rayleigh damping. Forced vibrations: modal superposition and step by step methods. Continuous systems. Applications to seismic design of structures, blast and impact effects on structures and wind engineering
Lecture times: 40 hours (1 week block lectures).
DP requirements: None
Assessment: Coursework 50%, examination 50%.

**CIV5114Z  FOUNDATION DESIGN**
Not offered in 2018
16 NQF credits at HEQSF level 9
Convener: Associate Professor D Kalumba
Course entry requirements: Suitable undergraduate degree qualification in an engineering, geosciences or geological field.
Course outline:
This course aims to furnish participants with the necessary knowledge and design skills required to ensure stability of both the ground, and any structure built in or on the ground. It will introduce participants to the application of theories of soil mechanics, applied mathematics and physics to provide solutions to the serviceability and ultimate limit states of geotechnical structures. Topics include: review of soil mechanics; working stress approach, limit state design; analysis and design of shallow and deep foundations; determination of settlement of structures; use of foundation design standards such as Eurocodes, SANS 10160; etc.
Lecture times: 40 hours (1 week block lectures).
DP requirements: None
Assessment: Coursework 50%, project 50%.

CIV5115Z  BRIDGE MANAGEMENT & MAINTENANCE  
*Not offered in 2018*  
10 NQF credits at HEQSF level 9  
Convener: Professor P Moyo  
Course entry requirements: BScEng  
Course outline:  
This course aims to introduce the principles of bridge management and maintenance. The focus is on both highway bridges and railway bridges. The course provides the basic philosophies behind bridge management systems, the structure of a bridge management system, and the implementation of bridge management system. Life cycle cost analysis of bridges are introduced. Linkages between bridge management, maintenance and rehabilitation of bridges is discussed. Key to this course are practical bridge inspections and case studies.  
Lecture times: 40 hours (1 week block lectures).  
DP requirements: None  
Assessment: Coursework 50%, examination 50%.

CIV5118Z  SAFETY OF SPECIAL STRUCTURES  
*Not offered in 2018*  
10 NQF credits at HEQSF level 9  
Convener: Professor P Moyo  
Course entry requirements: BScEng  
Course outline:  
The course introduces students to the governance and management of special structures. The procedures employed for safety evaluation are generally not specified in codes of practice. Probabilistic based risk analysis and surveillance techniques for the evaluation of loading and consequences of failure will be introduced. Case studies are used to demonstrate the principles.  
Lecture times: 40 hours (1 week block lectures).  
DP requirements: None  
Assessment: Coursework 50%, examination 50%.

CIV5119Z  STRUCTURAL PERFORMANCE ASSESSMENT & MONITORING  
*Not offered in 2018*  
20 NQF credits at HEQSF level 9  
Convener: Professor P Moyo  
Course entry requirements: CIV5113Z  
Course outline:  
This aims to introduce concepts of structural health monitoring of civil infrastructure. The course covers: philosophy of structural performance assessment, performance indicators, strategies for structural performance assessment, introduction to theoretical modal analysis, experimental modal analysis, instrumentation, data acquisition, data quality assurance, modal parameter estimation and validation, introduction to model updating, model updating methods, structural modifications, correlation between tests and FEM models, structural monitoring, measurement of live load strains/stresses, probabilistic data analysis, material performance assessment, performance assessment, and estimation of remaining life.  
Lecture times: 40 hours (1 week block lectures).  
DP requirements: None  
Assessment: Coursework 50%, examination 50%. 
**CIV5121Z**  DESIGN & MODELLING OF WATER DISTRIBUTION SYSTEMS  
Not offered in 2018  
20 NQF credits at HEQSF level 9  
**Convener:** Professor JE Van Zyl  
**Course entry requirements:** None  
**Course outline:**  
The aim of this course is to provide a structured and practical introduction to the design and modelling of water distribution systems. Topics include: Components of water transport and distribution systems. Water Demand: categories, patterns, calculation, forecasting. Hydraulics of Pipe Flow: basic equations, single pipe calculation, branched and looped networks, system-and pump characteristics and pressure dependent demand. Hydraulics of storage and pumps. Main components of Hydraulic Design: design parameters, choice of supply scheme and network layouts. Engineering design: choice of pipe materials, valves and other equipment. Pumps: review of pump types and their applications, design of pumping stations, power requirements and energy consumption, auxiliary equipment. Hydraulic modelling of distribution systems.  
**DP requirements:** None  
**Assessment:** Design assignment 100%.  

**CIV5122Z**  ADVANCED SOIL MECHANICS  
Not offered in 2018  
16 NQF credits at HEQSF level 9  
**Convener:** FC Chebet  
**Course entry requirements:** Suitable undergraduate degree qualification in an engineering, geosciences or geological field.  
**Course outline:**  
This course aims to provide extensive insight and depth to students’ understanding of the theoretical background involved in the design of geotechnical systems in order to facilitate critical thinking in geotechnical analyses. It covers advanced concepts and theories in soil mechanics fundamental to geotechnical engineering such as; shear strength of soils; stress-strain behaviour; drained and undrained shear strength; stress paths; critical state soil mechanics, failure criteria; constitutive models soil deformation analysis; stress distribution in soil; settlement of soil; and consolidation theory.  
**Lecture times:** 40 hours (1 week block lectures).  
**DP requirements:** None  
**Assessment:** Coursework 30%, examination 70%.  

**CIV5123Z**  CONTAMINATED LAND AND REMEDIATION  
Not offered in 2018  
16 NQF credits at HEQSF level 9  
**Convener:** Associate Professor D Kalumba  
**Course entry requirements:** Suitable undergraduate degree qualification in an engineering, geosciences or geological field.  
**Course outline:**  
This course aims to create awareness of the occurrence of and risks posed by contaminants in contaminated sites and remediation issues, and to develop basic engineering skills and knowledge required to identify appropriate remediation methods for contaminated land and waste disposal activities. It covers the problems associated with contaminated lands that arise from the unmanaged release of contaminants into the environment. Selected topics include: contaminated land definition; legal framework governing contaminated lands; contaminant types and transportation mechanisms, risk assessment procedures related to contaminated lands, site investigation and monitoring related to contaminated lands and remediation, and waste disposal methods.  
**Lecture times:** 40 hours (1 week block lectures).  
**DP requirements:** None
Assessment: Coursework 30%, examination 70%.

CIV5124Z  GEOSYNTHETICS ENGINEERING
16 NQF credits at HEQSF level 9
Convener: Associate Professor D Kalumba
Course entry requirements: Suitable undergraduate degree qualification in an engineering, geosciences or geological field.
Course outline: This course aims to introduce advanced students to geosynthetics and their applications in the built environment and covers important considerations in the use of geosynthetics to solve civil engineering problems. It includes methods of analysis, design, construction and field monitoring of structures constructed with geosynthetics. Topics include the behaviour and interaction of these materials in filtration, drainage, separation, reinforcement, erosion control and barrier functions.
DP requirements: None
Assessment: Coursework 30%, examination 70%.

CIV5125Z  LATERAL EARTH SUPPORTS
16 NQF credits at HEQSF level 9
Convener: Associate Professor D Kalumba
Course entry requirements: Suitable undergraduate degree qualification in an engineering, geosciences or geological field.
Course outline: This course aims to introduce students to the analysis of lateral earth pressures, various earth retention systems and its applicability, limitations and design. The course provides knowledge and tools for design and analyses of earth structures and earth retention systems. The selection, design and performance of earth retention structures used for support of fills and excavations will be covered as well as theory related to earth pressures and soil reinforcement.
Lecture times: 40 hours (1 week block lectures).
DP requirements: None
Assessment: Coursework 50%, examination 50%.

CIV5126Z  SLOPE STABILITY
16 NQF credits at HEQSF level 9
Convener: Associate Professor D Kalumba
Course entry requirements: Suitable undergraduate degree qualification in an engineering, geosciences or geological field.
Course outline: This course aims to demonstrate the application of concepts, principles and theories of slopes and to understand the different slope stabilization techniques and its applicability and limitations. The course focuses on stability of natural slopes and stability considerations related to man-made cuts and fills. Emphasis will be on the conditions up to and until the slip is initiated. Students will be introduced to different slide mechanisms, the conditions of their occurrence, and the theories and principles governing stability of slopes. The course will also include other important aspects such as: field investigations to obtain input for slope stability analysis; slope stability analysis programmes; slope monitoring techniques and slope stabilisation methods.
Lecture times: 40 hours (1 week block lectures).
DP requirements: None
Assessment: Coursework 50%, examination 50%.
CIV5127W DISCRETE CHOICE MODELLING AND STATED CHOICE SURVEY
20 NQF credits at HEQSF level 9
Convener: Associate Professor M Zuidgeest
Course entry requirements: No prior knowledge of discrete choice models is needed. Basic topics are covered early in the week, while more advanced topics are covered later. It is however assumed that participants have a basic knowledge of statistical methods, including linear regression models. Hence, first year university mathematics and statistics are required.
Course outline:
This course will study the specification, estimation, and application of discrete choice models as well as the design of stated choice experiments. Day 1: Introduction to choice modelling and multinomial logit, Data & estimation, Analysis of results and specification testing, Estimation of logit models (Exercise). Day 2: Nested logit & other GEV models, Estimation of GEV models (Exercise), Latent class, mixed logit & simulation based estimation, Estimation of latent class & mixed logit (Exercise). Day 3: Model applications: sampling, forecasting and appraisal, Model fitting exercise (Exercise), Alternative models and examples, Case studies in South Africa I. Day 4: Stated choice surveys, Generating a design (Exercise), Drawbacks of orthogonal designs. Day 5: Efficient designs, Generating efficient designs (Exercise), Case studies in South Africa II.
DP requirements: None
Assessment: Coursework 100%

CIV5128Z LOSSES AND PRESSURE MANAGEMENT IN WATER DISTRIBUTION SYSTEMS
20 NQF credits at HEQSF level 9
Convener: Professor K van Zyl
Course entry requirements: None
Course outline:
This course aims to teach theory and application of water losses and pressure management in water distribution systems. Topics include: water loss components and methods, pressure and leakage, impact of pressure on other network parameters, soil-leak interaction, pressure management zones, pressure control, night flow analysis and pressure-leakage parameter estimation.
DP requirements: Attend all contact activities and submit all assignments on time.
Assessment: Coursework 50%, examination 50%.

CIV5129W GEOTECHNICAL ENGINEERING PROJECT
45 NQF credits at HEQSF level 9
Convener: Associate Professor D Kalumba
Course entry requirements: None
Course outline:
The aim of the course is to offer students an opportunity to undertake a case study project in which they are able to develop skills in analysing and providing solutions to typical geotechnical engineering problems encountered in the field. The project is intended to provide a platform for the students to put into practice the methodological and technical competencies acquired during the taught course work component of the programme. A statement of objectives of the geotechnical engineering project will be agreed upon, and the course of study will be guided by the supervisor. The programme will involve the student in about 450 hours of work, and a written output in the form of a report is submitted.
DP requirements: None
Assessment: Project report 100%.

CIV5131Z RESEARCH DESIGN AND METHODOLOGY FOR CIVIL ENGINEERS
16 NQF credits at HEQSF level 9
Convener: Associate Professor M Zuidgeest
Course entry requirements: None
Course outline:
This course aims to develop conceptual skills for conducting research at the master’s level. Topics include: the scientific method, induction and deduction, inference, statistical thinking and ethics, as well as technical skills which include technical writing, searching and interpretation of scientific literature, proper use of citations, and communication of research outputs.
Lecture times: 40 hours (1 week block lectures).
DP requirements: None
Assessment: Coursework 100%.

CIV5132Z TRANSPORT DEMAND ANALYSIS AND PROJECT ASSESSMENT
20 NQF credits at HEQSF level 9
Convener: Associate Professor M Vanderschuren
Course entry requirements: None
Course outline:
This course aims to develop an understanding of transport demand analysis and project assessment. Topics include: travel data collection and survey design; data processing and analysis; the link between methodological approaches to transport analysis and the analytical questions raised by different policy environments; theoretical and philosophical backgrounds of assessment and evaluation methods; and techniques for the assessment and evaluation of urban transport proposals.
DP requirements: None
Assessment: Preparatory Assignments 15%; group assignment 10%; major assignment 50% and course test 25%.

CIV5133Z TRANSPORT MODELLING
20 NQF credits at HEQSF level 9
Convener: Associate Professor M Zuidgeest
Course entry requirements: First year course in statistical methods or mathematics.
Course outline:
This course aims to develop an advanced understanding of transport modelling principles and skills in working with these models. Topics include: transport modelling types and scales; theory of travel demand modelling, including the four-step transport model (i.e. trip generation, trip distribution, mode choice and traffic assignment); output analysis; land use – transport interaction models, as well as theory of traffic flow dynamics, including capacity assessment, LOS assessment, shockwave analysis, dynamic traffic management and elementary traffic control design. The course ends with a discussion about the link between models and the analytical questions raised by different policy environments.
DP requirements: None
Assessment: Preparatory Assignments 15%; group assignment 10%; major assignment 50% and course test 25%.

CIV5134W MASTERS DISSERTATION TRANSPORT STUDIES
120 NQF credits at HEQSF level 9
Convener: As per programme requirement.
Course outline:
The dissertation should incorporate any or all of the following: a research project of a theoretical or practical nature; a critical review of a specified topic based upon a comprehensive search of the literature or available data; development of an item of equipment or a technique involving novel features or advanced design; or any other study acceptable to the Faculty.
Assessment: 100% written work
CIV5135W  TRANSPORT PLANNING AND ENGINEERING METHODS  
PROJECT  
25 NQF credits at HEQSF level 9  
Convener: Associate Professor M Zuidgeest  
Course entry requirements: None  
Course outline:  
This course aims to offer students an opportunity to undertake a research project in which students are able to develop and enhance skills in a selected area of professional practice. The research would involve undertaking a critical investigation of the origins, rationale, and debates surrounding the particular professional practice, and the necessary activities associated with applying the practice and reflecting on how it might be improved.  
DP requirements: None  
Assessment: Project report 100%  

CIV5142Z  FINITE ELEMENT MODELLING IN STRUCTURAL ANALYSIS  
16 NQF credits at HEQSF level 9  
Convener: Associate Professor S Skatulla  
Course entry requirements: None  
Course outline:  
The course aims to introduce advanced students to finite element modelling theory, typical applications in structural engineering and recommendations. The topics include fundamental approaches and solution strategies in finite element modelling; linear and non-linear structural problems; different types of non-linearity in structural engineering; implication of the various mesh types including truss, beam, plate and shell elements; the effects of h and p mesh refinements and mesh quality; different types of structural supports including rigid supports, elastic bedding, kinematic constraint supports, the influence on stress distribution and recommendations of suitable application; different treatment of concentrated loads and distributed loads and the effect of mesh resolution.  
DP requirements: Submission and satisfactory performance in all assignments.  
Assessment: 50% take-home major assignment and 50% final written examination.  

CIV6000W  PHD IN CIVIL ENGINEERING  
360 NQF credits at HEQSF level 10  
Course outline:  
A PhD thesis is required to be an original, coherent and consistent body of work which reflects the candidate’s own efforts. The thesis may not be more than 80 000 words. A candidate will undertake research, and such advanced coursework as may be required, under the guidance of a supervisor or supervisors appointed by Senate.  
DP requirements: None  
Assessment: Written work counts 100%.  

CIV9000Z  INTERNATIONAL AFFILIATE 2 MONTHS  
0 NQF credits at HEQSF level 0  

CIV9001Z  INTERNATIONAL AFFILIATE 2-4 MONTHS  
0 NQF credits at HEQSF level 0  

CIV9002Z  INTERNATIONAL AFFILIATE 4-6 MONTHS  
0 NQF credits at HEQSF level 0  

CIV9003Z  INTERNATIONAL AFFILIATE 6-12 MONTHS  
0 NQF credits at HEQSF level 0
CIV9004Z  POSTDOCTORAL FELLOW
0 NQF credits at HEQSF level 0

END5050X  MASTERS JOURNAL PAPER REQUIREMENT
0 NQF credits at HEQSF level 9

Course outline:
The aim of submitting a research paper for the masters’ degree is to develop an understanding of what is required for the publication of research findings. To this end a candidate shall submit a summary of the key aspects of the dissertation, presented in the form of a paper which is, potentially, of publishable standard, approved by a Panel of Assessors. This is a requirement for candidates submitting either a 180 or 120 credit dissertation for the following degrees: MSc in Construction Economics and Management, MSc(Eng), MSc(ProjMan), MPhil, MSc in Property Studies. Refer to the appropriate degree rules.

DP requirements: None