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DEPARTEMENT SIVIELE INGENIEURSWESE
DEPARTMENT OF CIVIL ENGINEERING

3rd Version 2017: 29/11/2017

NAGRAADSE STUDIES IN:

- SIVIELE INGENIEURSINFORMATIKA
- KONSTRUKSIE-INGENIEURSWESE EN -BESTUUR
- GEOTEGNIESE INGENIEURSWESE
- PLAVEISELINGENIEURSWESE
- STRUKTUURINGENIEURSWESE
- VERVOERINGENIEURSWESE
- WATERBOUKUNDE

POSTGRADUATE STUDIES IN:

- CIVIL ENGINEERING INFORMATICS
- CONSTRUCTION ENGINEERING AND MANAGEMENT
- GEOTECHNICAL ENGINEERING
- PAVEMENT ENGINEERING
- STRUCTURAL ENGINEERING
- TRANSPORTATION ENGINEERING
- WATER ENGINEERING

BROSJURE
NAGRAADSE STUDIES

2017

BROCHURE
POSTGRADUATE STUDIES

VOORWOORD

Nagraadse studie vorm 'n steeds toenemende deel van die aktiwiteite van die Departement Siviele Ingenieurswese, Universiteit van Stellenbosch. Dit word genoodsaak deur die veranderende nasionale en internasionale nywerheid, waarvoor steeds meer fundamentele insig en tegnologiese spesialisering van siviele ingenieurs geverg word. Hierdie brosjure bevat inligting oor die programme vir nagraadse studie aan die Departement Siviele Ingenieurswese, Universiteit van Stellenbosch. Dit moet gelees word saam met die **Jaarboek van die Universiteit van Stellenbosch nl. Algemeen (Deel 1)* en die *Fakulteit van Ingenieurswese (Deel 11)*, waarin die bepalende vereistes gestel word.
Verskeie nagraadse programme word aangebied, met as basisprogramme die **Meestersgraad in Siviele Ingenieurswese (M Ing (Navorsing) (Siviele Ingenieurswese) [M Ing(N)]** en die graad **Doktor in die Wysbegeerte (PhD)**. Ander nagraadse programme is die **NDI, M Ing (Gestruktureerd) (Siviele Ingenieurswese)** [**M Ing (G)**] en DIng.

Die **MIng (N)** is 'n navorsingsgebaseerde program, wat meestal voltydse studie en navorsing oor 'n tydperk van 18-24 maande vereis. 'n Navorsingstesis is die eindproduk, maar begeleide studie word vereis ter verwerwing van die nodige agtergrond vir die navorsingsproses en die assimilasie van fundamentele kennis en insig.
Die **MIng (N)-graad** het 'n totale kredietwaarde van **180 krediete**, bereken volgens ***SAQA-standaarde**.
In die volgende spesialiseringsrigtings binne Siviele Ingenieurswese word 'n kursusgebaseerde meestersgraad, naamlik die **MIng (S)**, ook ondersteun: Hawe- en Kusingenieurswese, Geotegniek, Vervoeringenieurswese, Plaveiselingenieurswese en Waterboukunde: Hidroulika en Hidrologie.
Die MIng (G)-graad is **180 SAQA krediete**, bestaan uit 'n projek met 'n minimum gewig van 33,3% van die totale krediete, aangevul deur gevorderde kursuswerk tot 'n maksimum van **66,7%** van die vereiste kredietotaal. Die **MIng (G)** maak voorsiening vir deeltydse studie, deurdat verskeie kursusse in blokformaat aangebied word wat op deeltydse basis bygewoon kan word.

****

Die taal van aanbieding van nagraadse studie, en in besonder van kursusmodules, is in ooreenstem MIng (N) met die strategiese raamwerk van die Universiteit as 'n taal-vriendelike instelling. Tipies Afrikaans en word Engels as medium van onderrig gebruik. Om buitelandse studente te akkommodeer word kursusmodules in Engels aangebied. Om praktiese redes is hierdie brosjure in Engels.

PREFACE

Postgraduate studies form a growing part of the activities of the Civil Engineering Department of the University of Stellenbosch. This is necessitated by the changing Civil Engineering Industry nationally and internationally, demanding more fundamental insight and technological expertise of Civil Engineers. This brochure provides information on postgraduate study within the Department of Civil Engineering, University of Stellenbosch. It should be read together with the **Calendar (Year book) of the University of Stellenbosch ie. General (Part 1)* and the *Faculty of Engineering (Part 11)*, in which the definitive requirements are stated.

Several postgraduate programmes are presented, with as basis programmes those for the **Master of Engineering (Research) (Civil Enginering) [M Eng (R)]** and **Doctor in the Philosophy of Engineering (PhD)**. Other postgraduate programmes are the **PDE**, **M Eng (Structured) (Civil Engineering) [M Eng (S)]**and **DEng**.

The **M Eng (R)** is a research based programme, generally requiring full-time study and research over a period of 18-24 months. A research thesis is the end product, but guided study is required to achieve the necessary background for the research process and the assimilation of fundamental knowledge and insight.
The **M Eng (R)** Degree has a total credit value of **180 credits**, calculated according to SAQA standards.
In the following fields of specialisation within Civil Engineering, a course-based master's degree, the **M Eng (S)**, is facilitated: Port and Coastal Engineering, Geotechnical Engineering, Transportation Engineering, Pavement Engineering and Construction Engineering and Management. For the **M Eng (S) Degree** a total credit weight of **180 SAQA credits** is indicated, with at least 33,3% of the total credits being awarded to a project and a maximum of 66,7% of the credits awarded to advanced course work. The **M Eng (S)** provides for part-time studies and as many courses are presented in block format may be completed on a part-time basis.
The language used for postgraduate studies, particularly in the case of coursework, is in line with the strategic framework of the University to be language-friendly. Afrikaans and English are used as the languages of instruction, to accommodate International students. Postgraduate courses are therefore frequently taught in English. For practical considerations, this brochure is presented in English.

***SAQA** = *South African Qualification Authority; 1 Credit implies 10 hours of intensive focus required. An internal accreditation system is also sometimes indicated by Administrative Division of the University of Stellenbosch (US): 1 US credit = 1.5 SAQA credit*
Jaarboek/Calendar: Links to all parts of the Calendar can be found on the University web site at: http://www.sun.ac.za

TABLE OF CONTENTS

1 INTRODUCTION 2

1.1 Postgraduate diploma in Engineering (PDE) 8
1.2 Research-based Master's programme: M Eng (R) 11
1.2.1 Academic framework 13
1.2.2 Extent and nature 16
1.3 Course-based Master's programme: M Eng (S) 19
1.3.1 Academic framework 21
1.3.2 Extent and nature 23
1.4 Doctor of Philosophy of Engineering (PhD) and D Eng 25
1.5 Qualifications for admission 28
1.6 Application for admittance and registration 42
1.6.1 PDE and M Degrees 43
1.7 Outline of application process for admission to Post Graduate studies 70
1.8 Important dates: Academic Calendar for 2017 75

2 RESEARCH-BASED MASTER'S DEGREE PROGRAMME (M ENG (R)) 101

2.1 Admission and pass requirements 103
2.2 Publication Requirements (papers) 108
2.3 Study programme and examination 111
2.4 Thesis 116
2.5 Research programmes 122
2.5.1 Civil Engineering Informatics 124
2.5.2 Geotechnical Engineering 126
2.5.3 Pavement Engineering 127
2.5.4 Structural Engineering 128
2.5.5 Transportation Engineering 131
2.5.6 Water Engineering 133
2.5.7 Construction Engineering and Management 137

3 COURSE-BASED MASTER'S DEGREE PROGRAMME (M ENG (S)) 140

3.1 Admission and pass requirements 144
3.2 Study programme 150
3.2.1 Manner of presentation 157
3.2.2 Examination of block course modules 159
3.3 Fields of specialisation 161
3.4 Scope of the project 167

4 THE POSTGRADUATE DIPLOMA IN ENGINEERING (PDE) 171

4.1 Admission and pass requirements 174
4.1.1 Minimum admission requirements 175
4.1.2 Preparatory studies 179
4.1.3 Minimum pass requirements 185
4.2 The PDE study programme 186

5 PHD AND D ENG STUDIES 188

6 COURSE MODULES 195

6.1 Course modules presented by the Department of Civil Engineering. 196
6.2 Mathematics and Applied Mathematics modules 199
6.3 Available and Prescribed course modules 202
6.3.1 Civil Engineering Informatics 205
6.3.2 Construction Engineering and Management 208
Geotechnical Engineering 218
6.3.3 Pavement Engineering 222
6.3.4 Structural Engineering 230
6.3.5 Transportation Engineering 235
6.3.6 Water Engineering 240

7 CO-OPERATION WITH OTHER UNIVERSITIES AND RESEARCH INSTITUTES 270

7.1 Bauhaus University Weimar, Germany 275
7.2 Bergische University Wuppertal, Germany 277
7.3 Technical University Berlin, Germany 279
7.4 Delft University of Technology, Netherlands 280
7.5 Technical University Darmstadt, Germany 282
7.6 Danish Hydraulic Institute, Denmark 284
7.7 CSIR Built Environment (Infrastructure Engineering) 285
7.8 Wuhan University of Technology, China 287
7.9 University of Montreal 288

8 TUITION FEES AND REGISTRATION PERIODS 294

Tuition Fees – Refer to Section 8 305

9 RESEARCH FACILITIES 333

APPENDIX I : SCHEDULE FOR COURSE MODULES 1
APPENDIX II: COURSE MODULE SYLLABI 1

Civil Engineering Informatics 2

SOFTWARE TECHNIQUES FOR GRAPHS AND NETWORKS 811 (MT09) 2
SYSTEM DESIGN OF AN OPEN ENGINEERING PLATFORM 5
DEVELOPMENT OF APPLICATIONS BASED ON AN OPEN ENGINEERING PLATFORM 8

Construction Engineering and Management 11

CONSTRUCTION RISK MANAGEMENT (10851-812) 11
CONSTRUCTION CONTRACT LAW (10824 – 842) 14
PPP AND PROCUREMENT (13003-811) 17
CONSTRUCTION MANAGEMENT (10821-812) 20
INFRASTRUCTURE ASSET MANAGEMENT (13002-811) 22
PROJECT MANAGEMENT 30
FINANCIAL & ECONOMIC MANAGEMENT 41
PROJECT LEADERSHIP AND THE ENVIRONMENT 43
CONSTRUCTION MANAGEMENT PROGRAMME (CMP) 811 46

Geotechnical Engineering 52

APPLIED GEOMECHANICS 811 (G03) 53

ADVANCED GEOTECHNICS 811 (G04) 55
FOUNDATION DESIGN 811 (G01) 57
SOIL BEHAVIOUR 841 (G02) 59

Pavement Engineering 61

ADVANCED BITUMEN TECHNOLOGY 811 (P08) 61
FLEXIBLE PAVEMENT DESIGN 841 (P02) 63
PAVEMENT CONSTRUCTION 841 (P03) 65
PAVEMENT EVALUATION AND REHABILITATION 811 (P06) 67
PAVEMENT MANAGEMENT SYSTEMS 841 (P05) 70
PAVEMENT MATERIALS I 811 (GRANULAR & CEMENTED) (P01) 73
PAVEMENT MATERIALS II 811 (ASPHALT) (P02) 75
PAVEMENT MATERIALS III 811 (BITUMEN STABILISED MATERIALS) (P09) 77
RIGID PAVEMENT DESIGN 811 (P07) 79

Structural Engineering 81

ADVANCED STRUCTURAL CONCRETE DESIGN 811 (MT13) 81
ADVANCED STRUCTURAL STEEL DESIGN 811 (MT12) 82
PROBABILITY AND RISK ANALYSIS IN CIVIL ENGINEERING 811 (MT02) 87
STRUCTURAL DYNAMICS 811 (MT11) 90
ADVANCED MECHANICS OF MATERIALS AND MODELLING (AMMM) 96

Transportation Engineering 101

GEOMETRIC ROAD DESIGN 811 (T01) 102
PUBLIC TRANSPORT 841 (T02) 103
TRAFFIC ENGINEERING 841 (T03) 105
TRAFFIC FLOW THEORY 811 (T05) 106
TRANSPORT ECONOMICS 811 (T07) 107
TRANSPORTATION PLANNING 811 (T06) 108
TRANSPORTATION SAFETY 811 (T04) 110

Water Engineering 112

DESIGN OF (LARGE) HYDRAULIC STRUCTURES 112
FLOOD HYDROLOGY 115
SPECIAL HYDRAULICS 121
SPECIAL HYDROLOGY 122
PIPELINE HYDRAULICS AND PUMPSTATION DESIGN 841 124
WATER AND WASTEWATER TREATMENT 127
WATER NETWORKS AND SERVICES PLANNING 131
WATER RESOURCES MANAGEMENT 140
INTRODUCTION TO COASTAL ENGINEERING 841 (W03) 142
COASTAL PROCESSES & DESIGN, FIELD DATA COLLECTION & ANALYSIS (W03-1) 144
NUMERICAL & PHYSICAL MODELLING (W03-2) 146
COASTAL & PORT STRUCTURES, DESIGN (W03-3) 148
COASTS, PORTS & THE ENVIRONMENT (W03-4) 150
INTRODUCTION TO PORT ENGINEERING 811 (W04) 152
PORT PLANNING & DESIGN (W04-1) 154
PORT MANAGEMENT (W04-2) 156
PORT INFRASTRUCTURE AND HANDLING EQUIPMENT (W04-3) 159

DREDGING AND INFRASTRUCTURE MAINTENANCE (W04-4) 161
FOUNDATION DESIGN G01 164
NUMERICAL SIMULATION OF FLUIDS TW888 165
APPENDIX III: COURSE MODULE SYLLABI FOR MATHEMATICS AND APPLIED MATHEMATICS 1
Mathematics and Applied Mathematics 2
PARTIAL DIFFERENTIAL EQUATIONS 20753834 4
NUMERICAL SIMULATION OF FLUIDS TW888 - 62820 888 5
POROUS MEDIA TW891 – 62839 891 6
SERIES SOLUTION OF PARTIAL DIFFERENTIAL EQUATIONS TW832 - 53783 832 (OLD: TW03) 8
ENQUIRIES

ADMISSION, REGISTRATION AND GENERAL ACADEMIC ENQUIRIES			
Position and function	**Name**	**Tel. No.**	**E-mail**
Chairman: Department of Civil Engineering - General academic matters	Prof JA du Plessis	+27-(0)21-808 4358	jadup@sun.ac.za
Administrative Officer: Postgraduate Studies - Application for admittance: www.sun.ac.za/pgstudies www.sun.ac.za/pgstudies	Mrs AJ de Wet	+27-(0)21-808 4404	amandadw@sun.ac.za
Faculty Secretary - Registration and fees	Mrs N Hartzenburg	+27-(0)21-808 4835	nicolepa@sun.ac.za
Departmental coordinator for Postgraduate studies	Dr M de Wet	+27-(0)21-808 4350	Mdw1@sun.ac.za
International Office: Applications by all foreign students http://www0.sun.ac.za/international/	Ms C de Doncker	+27-(0)21-8082566	cnm@sun.ac.za interoff@sun.ac.za
FIELD OF SPECIALISATION, RESEARCH PROGRAMMES, RESEARCH FUNDS			
Division of Water Engineering, Port and Coastal Engineering	Prof GR Basson	+27-(0)21-808 4355	grbasson@sun.ac.za
Division of Transportation and Geotechnical Engineering	Prof M Sinclair	+27-(0)21-808 3838	msinclair@sun.ac.za
Division of Structural Engineering and Civil Engineering Informatics	Prof GPAG van Zijl	+27-(0)21-808 4436	gvanzijl@sun.ac.za
Division of Construction Engineering and Management	Prof JA Wium	+27-(0)21 808 4348	janw@sun.ac.za

ADDRESS:

Postal Address:
Department of Civil Engineering
University of Stellenbosch
Private Bag X1, Matieland,
STELLENBOSCH, 7602,
South Africa

Physical Address:
Department of Civil Engineering
University of Stellenbosch
Banhoek Road
7600, STELLENBOSCH,
South Africa

Civil Engineering Homepage: http://www.civeng.sun.ac.za

University of Stellenbosch: http://www.sun.ac.za Engineering Faculty: http://www.eng.sun.ac.za

1 INTRODUCTION

This document offers information regarding all postgraduate programmes in Civil Engineering at the University of Stellenbosch. The background, structure, organisation, scheduling and contents of the programmes are presented with the main focus on students who wish to register in 2017 to commence postgraduate studies.

Postgraduate programmes focus primarily on Master's Degree and Doctorate level. In addition, a Postgraduate Diploma in Engineering, intended to bridge the gap for candidates with pure science study backgrounds to engineering studies, is presented in some disciplines of Civil Engineering.

At Master's Degree level the needs of industry are addressed by:
- The study of advanced material demanded by engineering practice;
- Developing the capacity for independent problem solving and research.

The **M Eng (Research) (Civil Engineering) [M Eng (R)]** program, a research based Master's degree, addresses these needs by generally demanding full-time research and guided studies to develop fundamental problem solving capabilities.

In the Civil Engineering disciplines of *Port and Coastal Engineering, Geotechnical Engineering, Transportation Engineering, Pavement Engineering and Water Engineering*, a course based programme, namely the **M Eng (Structured) (Civil Engineering) [M Eng (S)]**, is also presented to afford students the opportunity of studying advanced Civil Engineering curriculum material, complemented by the execution of a project. This programme is structured in a way that provides an opportunity for studying on a part-time basis.

An *abbreviated* specification of the respective programmes follows below.

1.1 POSTGRADUATE DIPLOMA IN ENGINEERING (PDE)

The PDE-programme offers the opportunity for candidates from pure, basic science study backgrounds to bridge the gap to engineering science, in preparation for more advanced postgraduate studies. It also presents candidates, who have received Bachelor's Degrees in Engineering from Universities of Technology with the opportunity to follow postgraduate studies at the Civil Engineering Department of the University of Stellenbosch subject to certain conditions. The PDE is only offered in the disciplines of Port and Coastal Engineering, Transport Engineering, Pavement Engineering and Construction Engineering and Management. The programme comprises a required number of course modules, which may be a combination of undergraduate and postgraduate courses, as determined by the study leader and the divisional head of the Civil Engineering field of spesialisation, as well as the student. The PDE programme is described in section 4 of this document.

1.2 RESEARCH-BASED MASTER'S PROGRAMME: M Eng (R)

The aim of the research-based programme is to develop the candidate's ability to handle independent scientific and technological investigations and to interpret the results at the Master's Degree level.

1.2.1 Academic framework

The distinctive characteristics of the research-based programme are as follows:
- An analytical, modelling and knowledge basis is obtained by guided studies under the supervision of specialists.
- Independent investigative capability is developed through the execution of research of a suitable topic and the writing of a thesis.

- The outcome of the programme is the ability to perform an in-depth investigation in respect of an identified problem, together with the additional expertise gained in the specialised field of study.
- The benefit of this programme to the profession is in the problem solving capability that is developed.
- The programme further provides a base for PhD studies through which in-depth research capabilities and specialised knowledge are developed.

1.2.2 Extent and nature

The research-based programme is comprised of the following:

- Full-time study of at least three semesters, resulting in a thesis, which is the final report of the research project.
- Fundamental courses may be prescribed to support knowledge development for the M Eng (R) programme. These courses must be passed but do not contribute to the total number of credits required for the degree.
- Practical relevance is ensured in that research projects are generally identified and frequently also funded by the industry.
- Research projects that can be accommodated are often part of a larger research theme, through which opportunities for financial assistance are made possible in the form of internships.

1.3 COURSE-BASED MASTER'S PROGRAMME: M Eng (S)

A structured study programme is compiled so that a Master's Degree can be obtained through the gaining of integrated knowledge and the development of an advanced ability in application. This study option is only be supported in the following specialisation fields: Construction Engineering and Management, Geotechnical Engineering, Pavement Engineering, Port and Coastal Engineering and Transport Engineering.

1.3.1 Academic framework

The academic framework of the programme consists of:

- A structured programme, based on courses in the sub-disciplines of Civil Engineering.
- Course modules with the following objectives:
  - Advanced knowledge and techniques;
  - Implementation of new methods and techniques.
- The ability to apply advanced knowledge is demonstrated by the execution of a project requiring a high level of integrated application, synthesis and innovation.

1.3.2 Extent and nature

The extent and nature of the programme is as follows:

- The programme is presented in such a manner that it can be completed on a part-time basis.
- The programme has a close association with practice in that the course content will be based on applications and because specialists from practice are often called upon to present some of the courses.
- The total credit weight of the coursework amounts to two thirds of the total M Eng (S) credit weight, and the project one third.

1.4 DOCTOR OF PHILOSOPHY OF ENGINEERING (PhD) AND D Eng

Strong national and international networks and interaction support the PhD study and research program at the Civil Engineering Department of the University of Stellenbosch which offers candidates the opportunity to become national / international specialists and leaders in the field of Civil Engineering.

Two formats of Doctor of Engineering are presented, namely the PhD and the Doctor of Engineering (DEng) degrees. The study and research for the PhD and the DEng degrees are arranged as described in section 5 of this brochure and in the University Calendar, Part 1 (Section: Higher Degrees) and Part 11 (Section 6.3 (PhD) and Section 6.4 (DEng)).

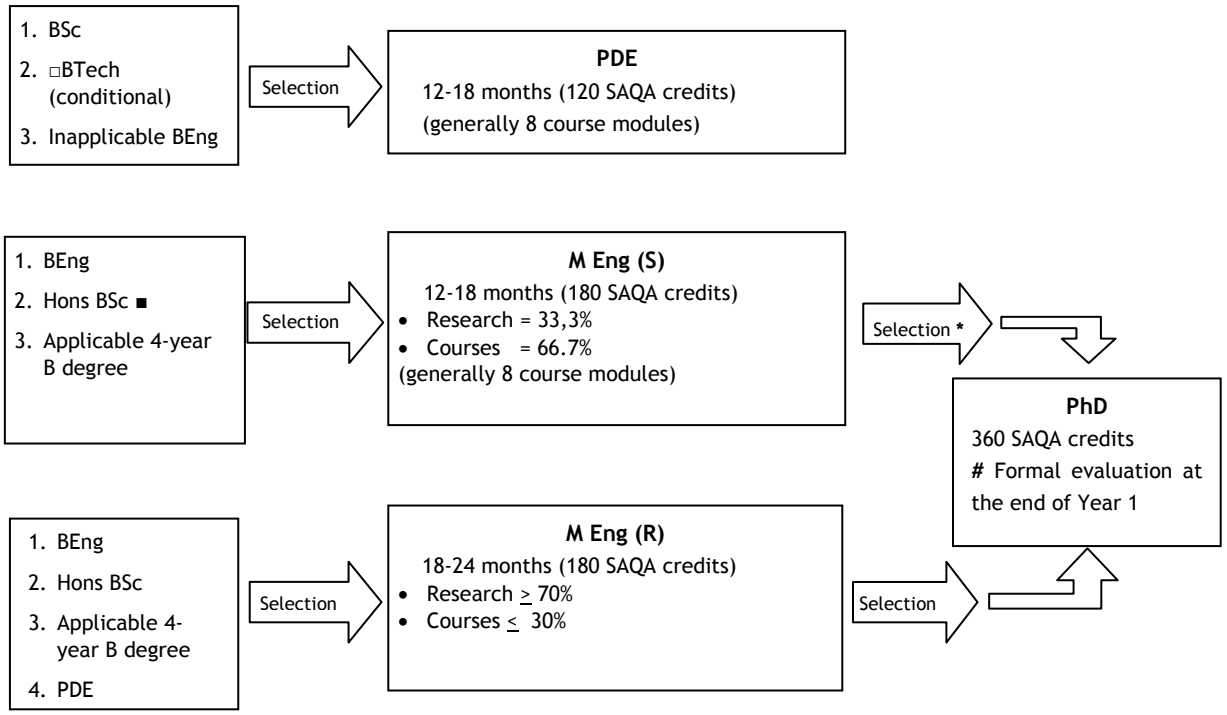
1.5 QUALIFICATIONS FOR ADMISSION

The flow diagram below shows the minimum requirements for admission to the respective postgraduate programmes. Candidates in possession of a recognised four-year Bachelor's Degree in Engineering (BEng or BScEng), or a qualification accepted by the Senate to be equivalent, may apply for admission to the M Eng (S) or M Eng (R) Degree programmes. The academic merit and course programme curriculum content of candidates with BTech and BSc qualifications will be evaluated to determine their eligibility for registering for the PDE. Refer to section 4.1.2 for information on preparatory studies which may be required. More specific and additional requirements for admission to the postgraduate programmes are described in the relevant Sections (Section 2 - Section 5).

A Departmental Postgraduate Admission Committee considers applications to all postgraduate programmes to PDE and Master's Degree level. A minimum admission requirement of 60% average over the four year period of undergraduate study, as well as for the final year of study, applies. Refer to Section 4.1.1 for students with a BTech degree.

Conditional admittance may be considered for those who do not fully qualify for admission by the Departmental Postgraduate Admission Committee. A committee with representation from outside the Department considers admittance of doctoral candidates, for recommendation to the Faculty and Senate. The academic record of the candidate and the academic relevance of the proposed topic are taken into consideration.
All candidates should be proficient in English.
General: There is limited capacity available in many post graduate disciplines and this may prevent further studies at post graduate level even though the above minimum requirements are met.

QUALIFICATION/ADMISSION MODEL FOR POSTGRADUATE PROGRAMMES



* **Selection:** Proof of Research Capability required.

\# **Formal PhD evaluation at the end of year 1** → oral evaluation by promoter/s, as well as 2 independent lecturers of the Department (The Department may require a written report of the student prior to such an evaluation session.

□ See Par 4.1.2 for detail. **1 SAQA Credit = 10 hours of work**

■ With science and mathematics as undergraduate subjects.

Please also refer to Section 8 regarding **maximum periods of registration** applicable to the respective postgraduate programmes.

1.6 APPLICATION FOR ADMITTANCE AND REGISTRATION

The procedure for registration for the various postgraduate programmes is as follows:

1.6.1 PDE and M Degrees

(a) **South African citizens** should please complete the **Initial Application Form** for admission to one of the postgraduate programmes and send it to the **Secretary: Postgraduate Studies**. This form is available as a separate file on our website under *Programmes/Postgraduate* or from the Secretary for Postgraduate Studies (p.1) (Foreign Students: Please refer to (f) below.)
Electronic applications at the following address: www.sun.ac.za/pgstudies

(b) The Initial Application must be submitted along with:
- A certified copy of the Degree or Diploma complying with the admission requirements;
- Certified copies of the complete study record (marks) achieved towards obtaining the required qualification;
- A short Curriculum Vitae.
- A preliminary overview of the research interest or intended course module attendance is also useful, but not compulsory.

To save time Initial Applications and the required documentation may be forwarded by e-mail of fax, but certified copies may be requested and **candidates must be able to present the original documentation to the Department or the Administration Authorities of the University on request.** (Note: Students who have achieved their undergraduate qualification/s at another institution will **definitely** be required to present **original certificate/s** to the Faculty Secretary (p.1) **prior to registration.**

An indication of the final dates for application for a particular academic year is given in Section 1.7. Generally, *Initial Applications* can still be accepted until middle January to possibly commence studies in the first semester and until the end of May to commence studies in the second semester (if applicable).

(c) The application is evaluated by the Departmental Postgraduate Admission Committee and their decision forwarded to the Dean of Engineering, University of Stellenbosch, for final acceptance.

(d) The candidate is informed of the final decision in writing by the Faculty Secretary (p.1).

(e) Upon acceptance, the candidate must register for the particular programme. This is administrated by the Faculty Secretary (Contact details: p.1) Final dates for registration for a particular academic year are given in Section 1.7.

(f) **Foreign candidates do not** use the same Initial Application Form as for South African candidates. They could make preliminary contact with a lecturer in their field of interest, but they have to **apply** for admission to any postgraduate programme offered by the Department **through the International Office**. Instructions regarding the procedure and the correct form/s to use can be found on the website of the International office along with other useful information:

- Contact details for the International Office:
  International Office of the University of Stellenbosch
  University of Stellenbosch
  Private Bag X1
  7602 Stellenbosch
  South Africa
  Tel: +27-(0)21-808 4628
  Fax: +27-(0)21-808 3799
  E-mail: interoff@adm.sun.ac.za
  http://www0.sun.ac.za/international/
- **Important:** Students who intend to do full-time study, or visits for periods longer than 30 days at a time, must bear in mind that they may need study permits. Acquiring these may entail lengthy processes and therefore allowance must be made for delays caused by diplomatic procedures. Applications should be submitted at least **4 months** before the intended starting date of full-time study, i.e. generally September for the first semester of the following year, or March for the second semester of the same year. Note that commencing studies in the second semester may not apply to all postgraduate programmes.
- Although Foreign candidates submit their applications through the International Office, it is recommended that candidates also notify the Secretary Postgraduate Studies that the application has been submitted.

(g) Entries cannot be changed retroactively in subsequent years. All entries are subject to external audits as required by the Department of Higher Education and Training. Once an academic year is concluded, the study record is also concluded in this manner.

(h) It is the students' responsibility to manage their annual registration and to keep it up to date, including modules for which they are enrolled. It is NOT the Postgraduate coordinator or study leader's responsibility.

(i) If necessary, a student must request interruption of studies in the academic year and preferably no later than April of the same year. If granted, the fees for that year are credited. It may not be requested retroactively in the next academic year. 'Interruption of studies' form is available from Amanda de Wet.

(j) The Students may not choose in which year they will "actively" continue their studies. Once a student is enrolled, he/she must annually register his/her studies until graduation. A student can only

interrupt his/her studies by FORMALLY applying for interruption of studies. It is normally only awarded once for the applicable degree by the Faculty Council and Senate on the recommendation of the Department, if motivated well. There are Postgraduate students who are under the impression that they can select which year they want to continue their studies. The previous year's tuition fees will be imposed when a student registers for studies after he/she failed to register without the necessary permission. There are other institutions that deal with this situation in a much tougher manner. Once a student does not register without permission, his/her studies are considered discontinued. Should the student wish to continue his/her studies again, he/she will have to re-apply for the degree and register again.

(k) A student following a PDE cannot be upgraded to a MEng(Structured) programme.

PhD

(a) Consult an academic staff member who could possibly act as promoter for the PhD studies: identify thesis title, aims and scope of work, methodology and programme.

(b) Complete the enclosed application form and a University of Stellenbosch registration form (available from the Faculty Secretary, p.1) and attach the following:
- A certified copy of the Degree complying with the admission requirements.
- Certified copies of the complete study record towards obtaining this qualification.
- Proposed thesis (dissertation) title, aims, scope of work, methodology and study programme.

(c) **All foreign candidates** should send their applications via the International Office of the University of Stellenbosch. (Refer to Section 1.6.1.(f)) Electronic applications: www.sun.ac.za/pgstudies

(d) The application is evaluated by the Departmental Postgraduate Admission Committee.

(e) On the recommendation of this Committee, the application is evaluated by a Faculty Committee and the decision is forwarded to the Faculty Board.

(f) After acceptance by the Faculty Board, the application has to be approved by the University Senate.

(g) The candidate is notified of the outcome in writing by the Faculty Secretary.

Tuition Fees – Refer to Section 8

General note regarding fees: In addition to the Tuition Fees indicated under Section 8 and on the study fee statements of students, **candidates may be required to pay for course notes, lunches, handbooks or other study material with regard to block courses or studies in general.** With some block courses students may also have the option of partaking in lunches at an additional cost. These fees are paid directly to the secretary of the relevant division.
Note that M Eng (R) students registering for modules presented by other Departments or Universities may be required to pay additional full tuition fees for these modules.

1.7 OUTLINE OF APPLICATION PROCESS FOR ADMISSION TO POST GRADUATE STUDIES

1. On receipt of an enquiry on post graduate studies the departmental post graduate administration office refers the applicant to the web-site www.sun.ac.za/pgstudies.
2. The applicant completes and submits the on-line versions of the application forms available on the web site.
3. The departmental post graduate administration then prepares a file for the applicant containing his/her application documentation received from the central administration office which includes the study record.
4. Information for students from abroad is vetted by the International Office of the University.
5. The application file is scrutinised and information summarised for consideration by the departmental post graduate application committee.
6. The decision on acceptance or not for post graduate studies by the committee is communicated to the candidate via e-mail.
7. The applicant's documentation is then forwarded to the central administration where the engineering faculty secretary prepares and dispatches a formal application letter to the candidate.
8. The departmental post graduate administration office then contacts the student and supplies information on the registration process and study fees as well as the first contact information meeting which the student needs to attend.
9. The student completes the registration process on the University Web-site and/or at the central administration office.

1.8 IMPORTANT DATES: ACADEMIC CALENDAR FOR 2017

All dates below provide a provisional guideline subject to finalisation by the University.

15 January 2017

Closing date for the 'Initial Application' to Department for admission to postgraduate studies starting in **2017** (except Foreign Students: Section 1.6.1f).

30 January 2017

Start of the Academic Year, specifically for undergraduate students, but also of some semester based postgraduate courses. Postgraduate students (especially those on course based programmes, e.g. M Eng (S)) should contact their study leaders as soon as admission has been approved (alternatively by the 2nd week in January) regarding their study programme for the year and the lecture times for the applicable semester courses. Some block courses are presented as early as January (see Appendix I). Course schedule available on Civil Engineering's website: www.civeng.sun.ac.za
Please note: Full time Postgraduate students at 08:00, Room S202, Second level, Structural Engineering, Civil Engineering Building.

Agenda closes for Faculty Committee Meeting

2, 3 9, 10 February 2017

Colloquia: MEng [Research] Students.

8 February 2017

Faculty Committee Meeting

16 February 2017

Final date for Department to load final marks for candidates graduating in March 2017.

22 February 2017

Final date for candidates graduating in March to load your Master's Degree theses or Doctoral Dissertations electronically on the US System.

10 March 2017

Postgraduate Function - Civil Engineering.

15 March 2017

Graduation Ceremony for Civil Engineering (Master Degrees10:00, Coetzenburg)

31 March 2017

Final date for registration of new postgraduate candidates starting in the first semester, 2017.

25 April 2017

Agenda closes for Faculty Meeting

3 May 2017

Faculty Committee Meeting

17 July 2017

Agenda closes for Faculty Meeting. (Appointment of Examiner forms for December Graduation).

26 July 2017

Faculty Committee Meeting

30 July 2017

Last day to add or cancel sub modules for the year (PDE and MEng Structured students).

4 August 2017

PhD: Final version of dissertation ready for submission to examiners, to be handed to Promotor – Dec Graduation.

1 June - 6 September 2017

MEng: Final version of thesis ready for submission to examiners, to be handed to Supervisor – Dec Graduation.

7 September – 15 October 2017

MEng: Final version of thesis ready for submission to examiners, to be handed to Supervisor – March Graduation.

16 October 2017

Agenda closes for Faculty Committee Meeting
PhD's students documents must be send to Faculty Secretary for graduation in December 2017.

25 October 2017

Faculty Committee Meeting

31 October 2017

PhD: Final version of dissertation ready for submission to examiners, to be handed to Promotor - March 2017 Graduation

2, 3, 9, 10 November 2017

Colloquia: MEng [Research] Students.

21 November 2017

Final date for Department to load final marks for candidates graduating in December 2017.

22 November 2017

Final date for candidates graduating in December 2017 to load your Master's Degree theses or Doctoral Dissertations electronically on the US System.

7 December 2017

Prize Giving Ceremony of the Department of Civil Engineering. (10h00)
Graduation Ceremony.(Coetzenburg, 17h30)

1, 2, 8, 9 February 2018

Colloquia: MEng [Research] Students.(March Graduandi 2018)

2 RESEARCH-BASED MASTER'S DEGREE PROGRAMME (M Eng (R))

The research-based Master's Degree programme extends over a minimum period of 18 months. The outcome of this programme is a civil engineering specialist with a fundamental in-depth training that is based on problem solving and advanced application within a field of specialisation. This programme will prepare candidates also for PhD research, and should therefore be followed by candidates who consider an advanced level of postgraduate qualification.

2.1 ADMISSION AND PASS REQUIREMENTS

A candidate with **a Bachelor's degree in Natural Science and a Honours degree from Stellenbosch University** may be admitted to the **MEng(R)** programme. An average pass mark of 60% or above is required for the BSc and Hons qualifications. If the Hons degree is from any other South African university, an average pass mark of 65% or above is required for the Hons degree. The MEng(S) programme may include two undergraduate modules in engineering which will imply full-time study of at least one semester. In water engineering if candidates do not have an engineering degree, only a BSc Hons degree in Hydrology may be considered for admission.

A candidate with a four year **BEng or a BSc(Eng)** or equivalent may be admitted to the **MEng(R)** program. An average pass mark of 60% or above is required for the BEng or BSc(Eng) qualification for students who did not study as Stellenbosch University. For Stellenbosch University students the requirement is 60 % or above, but applications of 55% or above will be accepted in exceptional cases.

A final mark of at least 50% must be achieved in each course module, as well as the thesis. The thesis comprises at least 70% of the final mark, proportional to the weight of the research project in terms of credits. The internal examiner, as well as an external examiner evaluate the thesis.

2.2 PUBLICATION REQUIREMENTS (PAPERS)

Publication of M Eng (R) research results

Journal Articles are to be supplied as specified in the Faculty of Engineering Calendar, paragraph 6.2.5.2 for MEng (Res) students. Calendar available: www.sun.ac.za

From 2018, all work that will find its way to publication or SUNscholar must include copyright permission from the original author to use images, graphs, etc., that have come from a third party even if figures etc. have been redrawn. It is the responsibility of the student to get such permission. If it is impossible to get permission, the student must be able to proof that sufficient effort has been used to get permission and track record of the efforts must be kept.

2.3 STUDY PROGRAMME AND EXAMINATION

The academic weight of the M Eng (R) programme comprises 180 SAQA credits.

The Degree is awarded based on the thesis submitted by the candidate. A programme for managed self-study and research is determined by the study leader, in co-operation with the Divisional Head. The weight of the thesis is 100%, of the total credits of the degree programme.

In addition to the thesis the candidate may be required to successfully complete certain course modules indicated by the study leader in preparation of the thesis. For successful completion of each module the candidate must obtain a pass mark based on the marks received for tests, assignments and an examination. No credits are received for passing the modules. As there is no formal examination time

table for the Postgraduate modules, examination dates will be set by the respective academic staff members.

The M Eng (R) programme generally requires **full time study** on the Stellenbosch Campus of the University. Part time study options will however be considered with prior arrangement with the potential study leader.

2.4 THESIS

The thesis is the product of study and research completed by the student under the supervision of the study leader. The thesis mark comprises 70% to 100% of the final mark. This is proportional to the weight in credits of the research project. The study leader(s) approve(s) the final thesis, but an independent internal examiner and at least one independent external examiner evaluate the thesis.

Through the thesis the candidate should demonstrate the ability to conduct an independent scientific and technical investigation and to interpret the results correctly.

The research for the thesis must lead to a paper and presentation at an international conference, or a paper in an acknowledged journal.

The fact that the thesis presents the candidate's own work and that it has not been presented at any other university must be declared by the candidate in the actual thesis.

Instructions regarding the format of the thesis are stated in the Calendar of the University of Stellenbosch, Part 1 (General), 'Rules for Higher Degrees'. This document is generally also available on the University website (p.1).

Provisions as to the format, final submission, duplication and binding of Master's theses available in the Calender of the University.

2.5 RESEARCH PROGRAMMES

Research programmes reflect the areas of specialisation and interest within the Department. Topics for Masters theses which fall within the research programmes and themes of the Department will ensure that the necessary study leadership will be available. Funds are often available for such thesis projects. Candidates may also enquire about assistantships or internships available in selected programmes, or for selected projects.

2.5.1 Civil Engineering Informatics

- A research programme covering various aspects of the application of Informatics in Civil Engineering is executed in parallel with the presentation of undergraduate and postgraduate courses on the subject. Some of the projects are listed under the field of application, such as structural engineering and Construction Engineering and Management.
- Computational management, including modelling of the engineering process.

2.5.2 Geotechnical Engineering

- Research in the geotechnical field concentrates on the fundamental properties of soils, dispersivity and electro-osmosis.

2.5.3 Pavement Engineering

- In Pavement Engineering the emphasis is on all aspects of flexible and rigid pavements with special reference to accelerated testing. The South African National Roads Agency (SANRAL), Industry and the Institute for Geotechnics Management and Transportation (GMT) support these projects.

2.5.4 Structural Engineering

- Efficient computer models for steel design.
- Application of structural reliability to the development of design criteria for structures.
- Reliability modelling and calibration of structural design codes of practice.
- Innovative applications of structural steel.
- Computational simulation and prediction of damage to concrete and masonry structures.
- Development of advanced cement-based materials and new products.
- Seismic behaviour of structures.
- Hybrid Concrete Construction.
- Liquid containing structures.
- Improvement of construction and structural design aspects for reduced environmental impact

2.5.5 Transportation Engineering

Research projects in Transportation Engineering are sponsored by the Department of Transport and include the following:

- Road safety.
- Intelligent Transport Systems
- Traffic Engineering.
- Transportation Planning and Logistics.

2.5.6 Water Engineering

Diverse sponsored projects in Hydraulics and Hydrology include:

- Hydraulic structures.
- Stormwater and River Hydraulics.
- Environmental studies.
- Sediment transport and Reservoir Sedimentation.
- Water resources planning.
- Water quality management and modelling.
- Eco-Hydraulics.
- Surface hydrology.
- Flood hydrology.
- Water Services.
- Water Demand Management.
- Water treatment.
- Water Networks analysis.
- Sewer Systems analysis.
- In Port and Coastal Engineering (part of Water Engineering Division) the emphasis is on Coastal Processes and Port Development. The Transnet, National Ports Authority of South Africa (NPA) sponsors a chair in this field since 2006.

2.5.7 Construction Engineering and Management

The Chair in Construction and Engineering Management addresses management in all areas of infrastructure development, being management by clients, consultants and contractors. Research is aimed at the following topics:

- Modular construction
- Risk management
- Infrastructure management
- Design management
- Large infrastructure projects

3 COURSE-BASED MASTER'S DEGREE PROGRAMME (M Eng (S))

A course based Master's Degree study programme requires a combination of course modules and a project. The nature of presentation provides practising civil engineers the opportunity of advanced study without having to take prolonged study leave. This can be achieved by means of structured studies, which culminate in the M Eng (S) Degree. This degree is offered in the following fields of specialisation:

- Construction Engineering and Management
- Geotechnical Engineering
- Pavement Engineering
- Port and Coastal Engineering
- Transportation Engineering

A set of course modules is compiled to provide a coherent curriculum of advanced studies in a field of specialisation. The course modules are formulated to be of an applied nature, whilst developing a high level of conceptual thinking. The project should demonstrate the ability of the candidate to solve problems in the chosen field of specialisation by synthesis and/or the application of one or more of the concepts in an innovative and practical manner.

3.1 ADMISSION AND PASS REQUIREMENTS

A candidate with **a Bachelor's degree in Natural Science and a Honours degree from Stellenbosch University** may be admitted to the **MEng(S)** programme. An average pass mark of 60% or above is required for the BSc and Hons qualifications. If the Hons degree is from any other South African university, an average pass mark of 65% or above is required for the Hons degree. The MEng(S) programme may include two undergraduate modules in engineering which will imply full-time study of at least one semester. In water engineering if candidates do not have an engineering degree, only a BSc Hons degree in Hydrology may be considered for admission.

A candidate with a four year **BEng or a BSc(Eng)** or equivalent may be admitted to the **MEng(S)** program. An average pass mark of 60% or above is required for the BEng or BSc(Eng) qualification for students who did not study as Stellenbosch University. For Stellenbosch University students the requirement is 60 % or above, but applications of 55% or above will be accepted in exceptional cases.

A candidate with a Bachelor's degree from a South African **University of Technology** and a **Honours** (B. Eng. Hons) degree from the University of Pretoria may be admitted to the **MEng(S)** programme (in same field as Hons), subject to an average mark for the Honours qualification of at least 65%.

A final mark of at least 50% must be achieved in each of the course modules, as well as the project. The final mark for the M Eng (S) Programme is the weighted average of course marks and the mark for the final project, averaged by weight in credits.

3.2 STUDY PROGRAMME

The programme for the M Eng (S) Degree requires the successful completion of course modules and a project. The project contributes to the final mark relative to its credit weight. The academic weight of the programme comprises 1800 hours (180 SAQA credits) of high level effective study, of which at most 66.7% (120 SAQA credits) is devoted to course modules and the remaining minimum of 33.3% (60 SAQA credits) to the project.

The majority of course modules are presented in block format facilitating part-time studies towards the M Eng (S) Degree. For Construction Engineering and Management course attendance is compulsory. A maximum study period of 4 years is allowed. It is possible to accelerate the part-time programme by spending more time on attending courses. Partial full-time study or the parallel completion of the project

can reduce the total duration of the programme. However, a candidate must be registered for the M Eng (S) programme for at least one full year in order to be awarded the Degree.

Course modules are generally presented in a three-year cycle. Some modules will be presented in a two-year cycle in order to provide some flexibility. In the Water Engineering Division, courses will be presented only on an *ad hoc* basis to satisfy the demand from industry, on other words not for credit purposes. (Courses in Port and Coastal Engineering may be an exception here.)

Individual modules are developed in such a way that pre-requisites are limited to the minimum. It is therefore possible to enter the programme at any time. In a few cases consecutive modules will be presented within one year.

Applicants must indicate a preferred field of specialisation. Before commencing with the coursework, a study leader will be appointed by the Departmental Chairman, in co-operation with the Head of the Division within which the candidate's preferred field of focus lies. At the start of the study programme, the candidate and the study leader will make an appropriate selection of course modules, to be approved by the Divisional Head.

In order to facilitate planning in advance, the provisional schedule for course modules over the next three years is provided. Final dates (and possible changes that may occur) are published on the Civil Engineering website (p.1). (Follow the link to 'Forthcoming M Eng (R) Courses.)

3.2.1 Manner of presentation

The presentation of the part-time course modules typically consists of three components:

- A course module is introduced by means of an intensive block week or weeks.
- A period of self-study follows each block. Presented material is studied and assignments are completed.
- An examination is set by the academic staff member.

3.2.2 Examination of block course modules

Admittance to the examination of a module is based on acceptable completion of assignments, which generally means a mark of at least 50% must be obtained. The date for the examination is set by the academic staff member.

The grades for the assignments and the mark for the examination, are combined as determined by the academic staff member, resulting in the final mark for the module.

3.3 FIELDS OF SPECIALISATION

The course-based Master's Degree programme is presented in the following fields of specialisation:

FIELD	CONTACT PERSON
Construction Engineering and Management	**Prof JA Wium** Tel: +27-(0)21-8084348; janw@sun.ac.za
Geotechnical Engineering	**Dr Marius de Wet:** Tel: +27-(0)21-8084350; mdw1@sun.ac.za
Pavement Engineering	**Prof Kim Jenkins:** Tel: +27-(0)21-8084379; kjenkins@sun.ac.za
Water Engineering: Port and Coastal Engineering (only to staff or bursary holders of TNPA)	**Prof Koos Schoonees;** kooss@sun.ac.za Tel: +27-(0)21-8084362
Transportation Engineering	**Prof M Sinclair:** Tel: +27-(0)21-8083838; msinclair@sun.ac.za

Special notice to students, who have commenced M Eng (S) studies prior to 2006:

M Eng (S) candidates, who have registered for M Eng (S) studies in specialisation fields other than the above, prior to 2006, must please note the following:

- In general, such candidates will be allowed to complete their M Eng (S) programme.
- It is recommended that such candidates communicate with their study leaders, especially in the event where changes to the previously projected block course schedule may affect their initial study programme.
- It may also be suggested to certain candidates (especially those specialising in Water Engineering, but possibly also other fields) to convert to an M Eng (R) programme, according to a study programme suggested by the relevant study leader and the Divisional Head concerned.

3.4 SCOPE OF THE PROJECT

The project for the course-based Masters Degree carries a credit weight as indicated in section 3.2 above. The project should demonstrate advanced and in-depth application and synthesis of the material concerning one or more of the topics covered in the course modules. Innovative application or novel integration of various fields will be highly rated.

Projects should generally be of such a nature that it would qualify as a paper to a conference, or an equivalent form of publication.

The study leader(s) approve(s) the final Project report, but an independent Internal moderator and at least one independent External moderator evaluate the Project report.

Instructions regarding the project format are given in the Calendar of the University of Stellenbosch, Part 1 (General) in the section concerning Higher Degrees. This document is also available on the University website (p.1).

4 THE POSTGRADUATE DIPLOMA IN ENGINEERING (PDE)

A postgraduate diploma programme is presented, which leads to the qualification Postgraduate Diploma in Engineering (PDE). This program is offered in the fields of Port and Coastal Engineering, Transport Engineering, Pavement Engineering and Construction Engineering and Management in the Civil Engineering Department of the University of Stellenbosch.

The academic merit and course programme curriculum content of candidates with BTech and BSc qualifications will be evaluated to determine their eligibility for registering for the PDE. Refer to section 4.1.2 for information on preparatory studies which may be required.

4.1 ADMISSION AND PASS REQUIREMENTS

4.1.1 Minimum admission requirements

A candidate with a Bachelor's degree from a South African **University of Technology** may be admitted to the **PDE** programme subject to an average mark for the qualification of at least 70%. Candidates may be required to do preparatory studies where an average pass mark of 60% or above, as described in 4.1.2, is compulsory.

A candidate may also be admitted to the **PDE program** if he/she is in possession of an acknowledged **Bachelor's degree in Natural Science** of a South African University. An average pass mark of 60% or above is required for the BSc qualification. The PDE program will include at least two undergraduate modules in engineering which will imply full-time study of at least one semester. A candidate may also be required to do preparatory studies where an average pass mark of 60% or above, as described in 4.1.2, is compulsory. The decision on required preparatory studies is made with reference to the candidate's academic record.

Any other non-engineering academic degree and experience, which is found to be acceptable, may be considered by the Departmental Admission Committee for admission to the PDE programme. A candidate may be required to do preparatory studies where an average pass mark of 65% , as described in 4.1.2, is compulsory. The decision on required preparatory studies is made with reference to the candidate's academic record.

4.1.2 Preparatory studies

The Department reserves the right to require of a candidate to perform preparatory/ supplementary studies before being admitted to the PDE-programme.

Of an applicant with a Bachelor's Degree of a South African University of Technology, it is required to have successfully completed the following courses, before admittance to the PDE.)

- Engineering Mathematics 214 & 252, Engineering Applied Mathematics B242 and Statistics for Scientists 314, as described in the year book of the Faculty of Engineering, University of Stellenbosch; or

- One course each in Mathematics, Mechanics and Statistical Methods, respectively equivalent to the above mentioned courses at the discretion of the Department, presented by an acknowledged South African University. In this regard, the following course modules offered by **UNISA** will be accepted:
    - Mat 1503 (Linear Algebra)
    - APM 1612 (Applied Mathematics: Mechanics 2)
    - APM 2611 (Applied Mathematics)
    - Introduction to Statistics STA1610

  The candidate will require a letter of motivation from the Department of Civil Engineering, University of Stellenbosch to UNISA to be allowed to enrol the above as course modules for non degree purposes.

- Applicants require a mark of at least 60% in the preparatory studies.

4.1.3 Minimum pass requirements

The pass mark for the programme is 50%. The final mark is the weighted average of course marks.

4.2 THE PDE STUDY PROGRAMME

The PDE-programme comprises a minimum of 120 SAQA credits in the form of coursework. The programme can be followed on a part-time basis, or full-time, depending on the composition of courses. A study leader is appointed by the Department. The study leader, in co-operation with the divisional head of the field of expertise, as well as the student, sets up a study programme, which can be a combination of postgraduate and undergraduate course modules of the Department.

5 PhD AND D Eng STUDIES

Applications to the **PhD** programme will be considered based on academic history and experience. A Master's degree is required for PhD admission, except under special circumstances when MEng enrolment is upgraded to PhD enrolment.

Programmes of study and research for the PhD and the DEng Degree are arranged as described in the **University Calendar**, Part 1 (Section: Higher Degrees) and Part 11 (Section 6.3 (PhD) and Section 6.4 (DEng)). Applications for admission should include full particulars of the candidate's academic record, together with a proposal for the research topic. A committee with representation from outside the Department considers admittance of doctoral candidates, for recommendation to the Faculty and Senate.

The academic record of the candidate and the academic relevance of the proposed topic will be taken into consideration.

Provisions as to the format final submission, duplication and binding of the doctoral dissertations available on the Civil Engineering's website: www.civeng.sun.ac.za

Publication of PhD research results

Journal Articles are to be supplied as specified in the Faculty of Engineering Calendar, paragraph 6.3.3 for PhD students. Calendar available: www.sun.ac.za

From 2018, all work that will find its way to publication or SUNscholar must include copyright permission from the original author to use images, graphs, etc., that have come from a third party even if figures etc. have been redrawn. It is the responsibility of the student to get such permission. If it is impossible to get permission, the student must be able to proof that sufficient effort has been used to get permission and track record of the efforts must be kept.

6 COURSE MODULES

6.1 COURSE MODULES PRESENTED BY THE DEPARTMENT OF CIVIL ENGINEERING.

The course modules to be presented by Department of Civil Engineering over the next three years are listed in the table of Appendix I in alphabetical order of fields of specialisation in the first place and secondly according to the course module title. Dates of presentation are indicated in the table to the extent that they were available at the time of this edition of the Brochure. Dates of presentation are regularly updated in the edition of the Brochure available on the Civil Engineering website (p.1) – follow the links through 'Programmes' and 'Continued education'. Please take note of the 'Date of this revision' indicated on the title page of the Brochure for reference.
In addition the course modules are also listed on the web site Postgraduate Schedule of Course Modules. Generally links are provided on the Civil Engineering Homepage (p.1), and also from the main page for 'Continued Education'.

6.2 MATHEMATICS AND APPLIED MATHEMATICS MODULES

The following course modules in Mathematics and Applied Mathematics are presented on behalf of the Department of Civil Engineering. Content descriptions are supplied in Appendix III. (Dates are subject to change)

Department	Course module title	Previous Code	SAQA Credits	Semester	
				I	II
Mathematics	Linear Algebra 38571814	IW01	15	▮	
Applied Mathematic (Dr Mf Maritz)	Partial Differential Equations 20753834	TW03	15	▮	
Applied Mathematics (Prof GJF Smit)	Numerical Simulation of Fluids 62820-775	-	15	▮	
Applied Mathematics (Dr GPJ Diedericks)	Porous media 62839-791	-	15		▮

6.3 AVAILABLE AND PRESCRIBED COURSE MODULES

In this section the course modules available for either the achievement of course credits, or for guided self-study, are summarised per field of research. The indication of SAQA credits would be relevant for PDE and M Eng (S) candidates and only in certain instances for M Eng (R) candidates. It may be required of M Eng (R) candidates to complete any of these modules or those listed under Section 6.2 (or any modules indicated by the Study Leader) as preparation for the thesis, i.e. not necessarily for credits.
Postgraduate candidates should also note that it is possible to complete certain relevant modules for credits at other institutions (especially those with an official study agreement with this Department, e.g. UCT – Refer to Section 7). Such modules must be **pre-approved for credits** by the study leader.

6.3.1 Civil Engineering Informatics

Specialisation in this field may be complimented by another field of study. The modules below may be supplemented with modules from another field with the approval of the study leader.

No	Course Module	Previous Code	SAQA Credits	Compulsory
1	Software techniques for graphs and networks 811	MT09	15	yes
2	System design of an open engineering platform		15	
3	Development of applications based on an open engineering platform		15	

6.3.2 Construction Engineering and Management

The objective of the Chair in Construction and Construction Engineering and Management is to promote management practices for the successful implementation of major capital projects.
Courses are presented through collaboration between:
· Department of Industrial Engineering
· Department of Civil Engineering
· Stellenbosch University Business School

Studies in this field may also typically compliment another field of specialisation. For more information on the courses/modules please visit the following website:
http://www0.sun.ac.za/civeng/uploads/documents/programmes/postgraduate/CEM%20course%20schedule%202012%0Rev9.pdf

The Construction Management Programme (CMP) is offered annually/bi-annually and is an extremely intensive and high level management course of 4 weeks. A **substantial course fee** applies, also to registered postgraduate students. Admittance for Degree purposes is based on special selection.

CMP course details can be found at: http://www.cmp.sun.ac.za

The following courses are available and relevant for the field of construction engineering and management.

Course module	Home department	SAQA Credits	Sem.	Compulsory
Technology Management	Ind. Eng.	15	1	
Construction Contract Law	Civ. Eng.	15	2	
Construction Management	Civ. Eng.	15	2	
Management Fundamentals for Engineers	Ind. Eng.	16	1	
Project Management	Ind. Eng.	15	1 & 2	Yes
Construction risk management	Civ. Eng	15	1	
Infrastructure Asset Management	Civ. Eng.	15	1	
PPP and Project Procurement	Civ. Eng.	15	1	

Geotechnical Engineering

The following table below lists courses that are available and relevant for the field of geotechnical engineering.

No	Course Module	Previous Code	SAQA Credits
1	Foundation engineering 811	G01	15
2	Soil behaviour 841	G02	15
*3	Applied Geomechanics 811	G03	15
4	Pavement materials I 811	PO1	15
5	Environmental analysis and decision-making 711 (Host Dept.: Geography)		To be confirmed
6	Advanced Geotechnics 811	G04	15
7	Probability and risk analysis 811	MT02	15

** Highly recommended (but not compulsory) for M Eng (R).*

6.3.3 Pavement Engineering

In order to attain the required number of course modules, the prescribed and/or recommended combinations tabulated below may be supplemented with modules in any other field of specialisation, subject to the approval of the study leader.

No	Course Module	Previous Code	SAQA Credits	M Eng (R)	M Eng (S)	
				Compulsory	Compulsory	Recommended
1	Pavement Materials I 811 (Granular & Cemented)	P01	15	* At least 2 course modules must be selected from Items 1 to 10	** At least 5 course modules must be selected from Items 1 to 10.	-
2	Flexible Pavement Design 841	P02	15			-
3	Pavement Construction 841	P03	15			-
4	Pavement Materials II 811 (Asphalt)	P04	15			-
5	Pavement Management Systems 841	P05	15			-
6	Pavement Evaluation & Rehabilitation 811	P06	15			-
7	Rigid Pavement Design 811	P07	15			-
8	Advanced Bitumen Technology 811	P08	15			-
9	Pavement Materials III 811 (Bitumen Stabilised Materials BSM-foam/emulsion)	P09	15			-
10	Probability and risk analysis in civil engineering 811	MT02	15	Yes		-
11	Continuum mechanics and finite element methods 841	MT04	15	* Recom.		-
12	Advanced Geotechnics 811	G04	15	* Recom.		-

** Completion of Items (13) or (14) (subject to annual availability) is highly recommended, but not compulsory. The balance of the 5 course modules required for M Eng (R) must be selected from Items (1) to (10).*
*** For M Eng (S) at least 5 course modules must be selected from Items (1) to (10) with supplementation by course modules chosen from any of the other fields, subject to the approval of the study leader.*

6.3.4 Structural Engineering

The courses tabulated below are available and relevant for the field of Structural engineering.

No	Course Module	Previous Code	SAQA Credits	Compulsory
1	Probability and risk analysis in civil engineering 811	MT02	15	
2	Continuums mechanics and finite element methods 841	MT04	15	Yes
3	Software techniques for graphs and networks 811	MT09	15	
4	Structural dynamics 841	MT11	15	Yes
5	Advanced structural steel design 811	MT12	15	Yes
6	Advanced structural concrete design 811	MT13	15	Yes
7	Advanced Mechanics of Materials and Modelling	AMMM	15	
8	Seismic Design of Building Structures		15	

Students specialising in Structural Engineering are required to follow at least five courses, of which four courses are compulsory and a fifth may be chosen from the other available postgraduate courses in Civil Engineering. Courses may also be selected from other South African Universities, in agreement with the Study Leader and Post Graduate Coordinator. Note that the research generally runs in parallel with coursework. The final mark for the M Eng (R) at the Dept of Civil Engineering is based on a 100% weight for the thesis.

6.3.5 Transportation Engineering

No	Course Module	Previous Code	SAQA Credits	M Eng (R)	M Eng (S)
				Compulsory	Recommended
1	Probability and risk analysis 811	MT02	15		Yes
2	Geometric road design 811	T01	15	-	Yes
3	Public transport 841	T02	15	-	Yes
4	Traffic engineering 841	T03	15	-	Yes
5	Transportation safety 811	T04	15	-	Yes
6	Traffic flow theory 811	T05	15	-	Yes
7	Transportation planning 811	T06	15	-	Yes
8	Transport economics 811	T07	15	-	Yes
9	Intelligent Transport Systems 811	T08	15	-	Yes
10	Human Factors in Traffic Collisions	T09	15	-	Yes

- *The balance of course modules required for M Eng (S) in Transportation Engineering may be selected from any field, subject to the approval of the study leader.*

Students specialising in Transportation Engineering are required to follow at least five courses, of which four courses are compulsory and a fifth may be chosen from the other available postgraduate courses in Civil Engineering.

6.3.6 Water Engineering

Water Engineering Modules (excl. Port and Coastal Eng) are listed below for study in the fields of:

a) River hydraulics and Design of hydraulic structures (Prof Basson)
b) Bulk water pipeline hydraulics & pumpstation design (Prof Basson)
c) Hydrology (Prof du Plessis)
d) Water Services (water distribution and sewer networks) (Prof Jacobs and Mr Loubser)
e) Water quality and treatment (Dr Brink)
f) Stormwater and drainage systems (Ms. Bosman)

The study leader will approve the 3 compulsory modules for M Eng (R) studies. For students who registered during 2017 for the first time a total of 3 modules are required, while students who registered during 2013 or earlier for the first time require 4 modules. (Note: The PDE, and MEng Structured are not offered in Water Engineering since 2012 (except for TNPA Port and Coastal Engineering students). Only the MEng Research programme is offered to students who enrolled after 2012. Students are required to enrol full time. Only in exceptional cases will part time MEng Research studies be allowed based on SA Citizenship, study record and a research environment).

Table 6.3.7.1

No	Course Module	SAQA credits
1	Design of Hydraulic Structures	15
2	Flood Hydrology	15
3	Water Resources Analysis & Management	15
4	Pipeline Hydraulics and Pumpstation design	15
	Stormwater and drainage systems	15
	Sewer Systems	15
5	Water Networks and Services Planning	15
6	Water and Wastewater treatment	15
7	Numerical simulation of fluids(1)	15
8	Introduction to Coastal Engineering (2)	15
9	Introduction to Port Engineering (2)	15
10	Special Hydrology	15
11	Special Hydraulics	15

Notes:(1) Numerical simulation of Fluids is a first semester course by the Applied Mathematics Department
(2) Port and Coastal Engineering MEng (R)/MEng (S) has specific modules; the main block courses are listed above (See section 6.3.8).

Modules for Port & Coastal Engineering (Prof Schoonees and Dr Theron) are listed in Table 6.3.7.2. The chair for this course programme is sponsored by Transnet National Ports Authority of South Africa (TNPA)
One of the aims of this programme is the advancement of teaching and research on post graduate level to graduates as well as professionals in practice (in both public and privates sectors) in the fields of Coastal and Port Engineering.
A formal course programme of modules is followed, as described in Appendix II. Short courses of one week in Port Engineering and Coastal Engineering are presented in alternate years, usually, during May of each year. Authorities, consultants, contractors and other universities are invited to these short courses. The subjects introduced in these block courses are presented in detail in 8 modules in 2017 (from 2018 over a period of two years).

Lectures are presented by US academics, assisted by invited overseas experts as well as local experts from the public and private sectors. The CSIR has a cooperative agreement with the US to assist with both lecturing of research topics as well as the making available of laboratory facilities for post graduate research projects (and undergraduate laboratory projects).

In the programme strong emphasis is placed on integration of environmental issues, global warming impacts (sea level rise, storm changes), and use of state of the art tools (computational numerical modelling) to address coastal and port design problems.

Relevant local coastal and port site visits will be incorporated in the course as well as a Port Design Task.

The table below presents a brief summary of course content. The course schedule for the next three years is presented in Appendix I under Port & Coastal Engineering. The fees for the different study levels are presented in Paragraph 8 below.

Table 6.3.7.2

No	Course Module	Code	SAQA Credits	M Eng (Research)	M Eng (Course Based)	PDE
*1	Introduction to Coastal Engineering 841 (short course)	W03-0	15	see footnote	see footnote	see footnote
2	Coastal Processes, field data collection & analysis	W03-1	15	Compulsory	Compulsory	Compulsory
3	Numerical & Physical modelling	W03-2	15	Compulsory	Compulsory	Compulsory
4	Coastal & Port Structures, Design	W03-3	15	Compulsory	Compulsory	Compulsory
5	Coasts & Ports and the Environment	W03-4	15	Compulsory	Compulsory	Compulsory
*6	Introduction to Port Engineering 811 (short course)	W04-0	15	see footnote	see footnote	see footnote
7	Port Planning and Design	W04-2	15	Compulsory	Compulsory	Compulsory
8	Port Management	W04-3	15	Elective	Compulsory	Compulsory
9	Port Infrastructure and cargo handling equipment	W04-4	15	Elective	Compulsory	Compulsory
10	Dredging & Infrastructure Maintenance	W04-5	15	Elective	Compulsory	Compulsory
11	Port Economics : Port Authority	U S Dept. Logistics (Econ. Faculty)	15	Elective	Not required	Not required
12	Port Economics : Terminal Operations		15	Elective	Not required	Not required
13	Foundation Design 811	G01	15	Elective	Not required	Not required
14	Numerical simulation of fluids	TW888	15	Elective	Not required	Not required
*15	Thesis for M Eng (R) (Research)		180	Compulsory	Not required	Not required
*16	Project for M Eng (S) (Course Based)		60	Not required	Compulsory	Not required

Notes:
*(*1) and (*6) are compulsory to attend for all students registered in the Port & Coastal Engineering Programme.*

*(*15) The Thesis mark will determine the student's final mark and the passing of all five compulsory courses is a precondition to obtain the degree.*

*(*16) The Project mark counts together with the module marks towards the overall pass mark of the M Eng (S) (Course Based)*

7 CO-OPERATION WITH OTHER UNIVERSITIES AND RESEARCH INSTITUTES

Co-operation with other universities both locally and abroad, provides opportunities to postgraduate students to attend courses at these universities without having to pay additional tuition fees. Modules attended in this manner are then considered part of the curriculum of the University of Stellenbosch.

Full particulars of courses that are available may be obtained from the heads of the Departments of Civil Engineering at the respective universities.

Note, however, that at least half the total number of course module credits and the entire thesis or study project credits required for a Diploma or Degree should be obtained at the residential university.

Students wishing to make use of this possibility should apply in writing to the Registrar (Attention: The Secretary, Faculty of Engineering), indicating which courses they wish to attend at other universities. Students must receive written confirmation before embarking on the proposed courses.

7.1 BAUHAUS UNIVERSITY WEIMAR, GERMANY

An agreement exists with the Bauhaus University Weimar (BUW), Germany. Provision is made for staff and student exchange. Students from the University of Stellenbosch, who study at BUW, are exempt from tuition and entrance fees.

7.2 BERGISCHE UNIVERSITY WUPPERTAL, GERMANY

An agreement exists with the Bergische University Wuppertal, Germany. Provision is made for staff and student exchange. Registered students from the University of Stellenbosch, who study at this institution, are exempt from tuition and entrance fees.

7.3 TECHNICAL UNIVERSITY BERLIN, GERMANY

An agreement with the Technical University Berlin was concluded to enhance research in the field of Civil Engineering Informatics at postgraduate level, and specifically at doctoral level. Joint research projects are underway in this field.

7.4 DELFT UNIVERSITY OF TECHNOLOGY, NETHERLANDS

An agreement of understanding exists with the Delft University of Technology (TUD). Provision is made for staff and student exchange. Students from the University of Stellenbosch, who study at TUD, are exempt from tuition and entrance fees for some programmes of study. TUD Lecturers actively participate in the Block Courses in Stellenbosch.

7.5 TECHNICAL UNIVERSITY DARMSTADT, GERMANY

An agreement exists with the Technical University Darmstadt, Germany. Provision is made for staff and student exchange. Registered students from the University of Stellenbosch, who study at this institution, are exempt from tuition and entrance fees.

7.6 DANISH HYDRAULIC INSTITUTE, DENMARK

Joint projects are underway to enhance post-graduate research in the field of mathematical modelling of river hydraulics, often with study visits to Denmark. DHI have recently provided their full software suite to the University of Stellenbosch for academic and training use, free of charge.

7.7 CSIR BUILT ENVIRONMENT (INFRASTRUCTURE ENGINEERING)

Close co-operation exists between the CSIR in the fields of *Coastal Engineering and Port infrastructure (CSIR Stellenbosch branch) as well as in the field of pavement engineering (CSIR Pretoria branch).*

7.8 WUHAN UNIVERSITY OF TECHNOLOGY, CHINA

An agreement exists with the Wuhan University of Technology, China in the field of Pavement Engineering. Provision is made for staff and student exchange. Registered students from the University of Stellenbosch, who study at this institution, are exempt from tuition and entrance fees and vice versa for WHUT.

7.9 UNIVERSITY OF MONTREAL

Definition and realisation of coordinated teaching and research programs in the following fields:
Hydraulics, closed conduits
Sewer system modelling
Water distribution system analysis and modelling

Exchange of professors, researchers, experts and advisors for limited periods to:

a) Participate in the development of scientific, technical and academic projects or provide their advice on such projects.
b) Assist in training of teaching personnel and organize training courses or workshops to this effect.

Exchange of documentation, organization of conferences or other activities related to the dissemination of scientific and technical information (publications, etc.).

Exchange of graduate students who are enrolled on a full-time basis at their home institution, to participate in academic and/or research activities which will be accredited by the host institution in order to fulfil part of the requirements to acquire a graduate degree at their home institution. In this case, students will have to conform to the conditions and requirements stipulated by the host institution.

8 TUITION FEES AND REGISTRATION PERIODS

The tuition model below indicates the policy of the Faculty of Engineering concerning **maximum periods of enrolment** that would be allowed for the respective postgraduate programmes in terms of the total amount of study years allowed since the first year of registration for the programme. This policy was approved in 2004 and has been effective since January 2005. Please note that:

- In the event that a candidate should exceed the allowed study period, the candidate will not automatically be allowed to simply renew registration, but will require the approval of the Faculty Committee to continue with studies. The candidate will need to apply for such renewal through the Faculty Secretary (p.1).
- The maximum registration periods for each respective programme, as indicated below, have effect on ALL postgraduate students.

The model below also indicates the **fee structure** for postgraduate programmes in all departments of the Faculty of Engineering, as approved by the Administrative Division for Student Fees (September 2008) with effect from January 2017.

Postgraduate students must be registered at the University before they register for the individual modules or else pay the full price of module.

Although care has been taken to present the actual fees accurately, candidates should please note that the University reserves the right to amend the fees indicated below without prior notice and that all fees should best be confirmed with Administrative Division for Student Fees (Tel: (021) 8084519 or the Faculty Secretary for Engineering (p.1) close to the time of registration.)

Important:
These fees may not apply to students who do not have South African citizenship.
All Foreign Students should please consult the International Office of the University of Stellenbosch regarding fees. (Refer to Section 1.6)

Also: The Tuition Fees indicated here and on study fees statements to candidates will not include possible **additional fees for course notes or hand books required for block courses (or other preparative work). These fees are generally paid directly to the secretaries in the Division hosting the relevant course.**
Note that M Eng (R) students registering for modules presented by other Departments / Universities may be required to additionally pay full tuition fees for these modules.

Tuition Fees – Refer to Section 8

General note regarding fees: In addition to the Tuition fees indicated under Section 8 and on the study fee statements of students, candidates may be required to pay for course notes, handbooks or other study

material with regard to block courses or studies in general. With some block courses students may also have the option of partaking in lunches at an additional cost. These fees are paid directly to the secretary of the relevant division.Legend:

	Normal duration of programme
	Final year granted for admission to programme
	Candidate needs to reapply for admittance to programme
	Not applicable to programme

PLEASE NOTE THAT THE FOLLOWING FEES ARE APPLICABLE TO THE MODULES PRESENTED BY THE ENGINEERING FACULTY ONLY
Take note the fees below is still for 2016, 2017's fees will be available early 2017.

PDE [120 SAQA credits]
Student must complete 8 modules successfully to obtain the Postgraduate Diploma in Engineering.

Year of registration	1	2	3	4
Full-time study	R 21 989	R 21 989	X	
PLUS cost per credit	R 252/credit	R 252/credit		
□Part-time study	R 21 989	R 21 989	R 21 989	R 21 989
PLUS cost per credit	R 252/credit	R 252/credit	R 252/credit	R 252/credit

-
-
-
-
- □Part time option discussed possibility with Study Leader.\

Postgraduate Diploma in Civil Engineering (120 credits)		
Estimate of Fees & Expenses for 2017		
Description	***Amount***	***Notes***
Tuition fee per year	*21 989.00*	*
8 x Sub modules	*30 240.00*	*1 sub-module = 15 credits x R252 / per credit =* *R 3 780 / sub module*
*Estimate for Course fees **payable to the Division** presenting the relevant course**	*8 000.00*	*Estimate of R1 000 per course* *(8 modules x R1 000)*

M Eng (S) [180 SAQA credits]

Student must complete 8 modules (120 credits) successfully and then project (60 credits) to obtain M Eng (S) degree.

Year of registration	1	2	3	4	5
Full-time study	R 21 989	**R 21 989**	**X**		
PLUS cost per credit	R 252/credit	**R 252/credit**			
Part-time study.	R 21 989	R 21 989	R 21 989	**R 21 989**	**X**
PLUS cost per credit	R 252/credit	R 252/credit	R 252/credit	**R 252/credit**	

M.Eng [Structured] Programme in Civil Engineering (180 credits)		
Estimate of Fees & Expenses for 2017		
Description	***Amount***	***Notes***
Tuition fee per year	*21 989.00*	*
8 x sub modules	*30 240.00*	*1 sub-module = 15 credits x R252 / per credit = R 3 780 / sub module*
Project	*15 120.00*	*Project = 60 credits x R252/credit = R 15 120* ***(once off)***
Estimate for Course fees ***payable to the Division*** *presenting the relevant course *	*8 000.00*	*Estimate of R1000 per course (8 courses x R1 000)*

Take note: **Registration fees payable every year with registration.**
***Additional fee differs between divisions – it can be more or less**

M Eng (R) [180 SAQA credits]

Thesis will count 100% - A total of 3-5 modules (can differ between Divisions) will be required.

Year of registration	1	2	3	4	5	6
Full-time study.	R 21 989	R 21 989	**R 21 989**	**X**		
Part-time study *Only with special arrangement*	R 21 989	R 11 849	R 11 849	R 11 849	**R 11 849**	**X**

PhD/DENG

Year of registration	1	2	3	4	5	6	7	8
Full-time study.	R 20 110	R 20 110	R 20 110	**R 20 110**	**X**			
Part time study	R 20 110	R 10 909	R 10 909	R 10 909	R 10 909	R 10 909	**R 10 909**	**X**

Part-time PhD studies are not encouraged.

Amount due is calculated for SAQA credits (as indicated in Appendix I). The Division for Student Fees may indicate fees according to an internal (US) credit system.

15 SAQA credits/course module (Appendix I) = 10 US credits/course module

SPECIAL STUDENTS (Register only for individual modules)

Study Fees (per module credit)	**R 252 / credit**
Operational cost per module	**As determined by Department**

INTERRUPTIONS OF STUDIES

The Faculty of Engineering's policy on interruption of Postgraduate studies only allows 1 year for the MEng and 2 years for the PhD programme.

Application for interruption must be submitted on the prescribed form, with supportive documents, before 30 April of the academic year.

Only the situation at work, medical reasons, financial reasons and highly personal circumstances, are considered as value reasons for approval of interruption of studies.

9 RESEARCH FACILITIES

Postgraduate study is closely linked to research. The Department of Civil Engineering has very extensive laboratory facilities, which have been planned and designed to serve both as a high-level undergraduate laboratory and as experimental laboratories for postgraduate research work. Some of these facilities are described below.

Geotechnical -, Pavement - and Transportation Engineering

The **Geotechnical laboratory** is well equipped for both research and specialist services to industry

The **Pavement Engineering** section has a selection of the latest materials testing and performance analysis equipment. The Bitumen Stabilised Materials' equipment includes:

Rachig Emulsion Mill,

WLB10S Laboratory FoaM Eng (R) Plant and

Twin-shaft Pugmill Mixer.

The bitumen and granular/cemented/asphalt material testing equipment includes

Shear-plate Rheometer, Dynamic Shear Theometer, Rotational Viscometer

Gyratory Compactor,

MTS Servo-hydraulic system for ITS, SCB, UCS, ITT and triaxial testing

UTM-25 pneumatic testing system for materials testing

IPC Four Point Beam Fatigue and Flexural Modulus Testing Apparatus and Monotonic Beam Tester

A model mobile load simulator (MMLS), developed in the laboratory by Prof Fred Hugo of the Institute for Geotechnics, Management and Transportation (GMT), is also available for accelerated pavement testing.

Transportation research is supported by an information system covering half a million references.

Structural Engineering and Informatics

Facilities are available for the experimental and numerical examination of structures. Software at our disposal includes Abaqus, Strand7, Diana, Prokon, Matlab and Comrel/Strurel.

A well equipped **materials and structural laboratories** include, amongst other items, the following components and equipment:

A vast range of concrete mixing equipment
Climate rooms
Steam curing facilities
Vibration tables
Drying ovens
State of the art three dimensional optical strain measurement system (ARAMIS)
Compression testing machine: 2 MN
Advanced Universal Testing Machine (250 kN)
2 x 50 kN and 2 x 500 kN Servo controlled hydraulic actuators
Full scale mechano type test frames
Various load cells and LVDTs and advanced measurement systems
Extensive computer facilities support structural analysis and information technology for civil engineers.

Water Engineering

The Division of Water Engineering has an enclosed hydraulics laboratory facility which comprises of mainly the following (including both Water Engineering and Port & Coastal Engineering facilities):

- A space of 3 000 m^2 which could be used for hydraulic experiments including three dimensional model studies. The space is serviced by overhead moving measuring bridges and a gantry crane.
- Four narrow glass wall flumes (two flumes of 1.5 m deep by 0.6 m wide by 22 m long and two flumes of 1.2 m deep by 1.0 m wide by 40 m long) in which flow experiments can be performed. One of the 1.0 m wide flumes is also equipped with a wave generator. (A maximum wave height of 200 mm can be generated.)
- One wide tilting glass wall flume (0.6 m deep by 2.0 m wide by 12 m long) for flow experiments.
- One large wave/current flume of 2 m wide by 2 m deep by 50 m long (30 m over which flow can be induced) with overhead gantry crane. (A maximum wave height of 500 mm can be generated.)
- Six supply pumps (total capacity of approximately 700 ℓ/s) with pipe and channel reticulation system and three constant head tanks.
- One 6 m wide wave generator for experiments in a wave basin with 0.3 m water depth.
- Measurement instrumentation (including flow and water level recorders).

Mathematical modelling is carried out as part of research using state-of-the-art models such as: Mike 11, HECRAS 1D/2D, Mike 21C, ANSYS Fluent, Mike 3, Delft3D etc.

APPENDIX I : SCHEDULE FOR COURSE MODULES

Postgraduate course modules offered by the Department of Civil Engineering, University of Stellenbosch

- The table below indicates when modules are scheduled to be presented over the 3 year period from January 2017 through December 2019. **Provisional dates** are indicated where available. These are updated regularly in the electronic version of this Brochure on the Civil Engineering website (p.1), under Programmes/Postgraduate and must be confirmed with the Secretary of the hosting division.
- In the table below course modules are listed alphabetically, firstly according to field and secondly to course module title. Notes regarding the content of course modules are provided in Appendix II in the same order. (Please note that a list of 'Forthcoming M Eng (R) Block Courses' arranged according to date, is also available on the website.)
- **Compulsory and recommended combinations for the respective fields of specialisation are indicated in Section 6 of the Brochure.**
- Unless indicated otherwise (refer to numbered footnotes) all the courses below are presented on the Campus of Stellenbosch University at the Faculty of Engineering.
- Enquiries and registration regarding the courses below can generally be made by e-mail to the reference provided with each field or by default to the Secretary of every division indicated in the Table below.
- Full time students must complete four semesters of Mentorships or Assistantships during the period of Postgraduate Studies.
- **Candidates may be required to pay for course notes, lunches, handbooks or other study material with regard to block courses or studies in general. These fees are paid directly to the Secretary of the relevant division and do not form part of your Tuition Fees.**

This schedule was last updated on 24/11/2016

Course Module Title and Number	Previous Code	SAQA Credits	Format	Availability per Semester					
				2017		2018		2019	
Civil Engineering Informatics: (natalies@sun.ac.za)				**1**	**2**	**1**	**2**	**1**	**2**
Software techniques for graphs and networks 811	MT09	15	Semester	As required / On demand					
System design of an open engineering platform	MT15	15	Semester	As required / On demand					
Development of applications based on an open engineering platform	MT16	15	Semester	As required / on demand					
Construction Engineering and Management: (janw@sun.ac.za)				**1**	**2**	**1**	**2**	**1**	**2**
[1] Construction Management Programme 811		30	Block	**11 June – 7 July**		**To be confirmed**		**X**	
Construction Management		15	Block				**X**		
Construction contract law		15	Block				**X**		
Construction Risk Management		15	Block			**X**			
Infrastructure Asset Management		15	Block	**20-21 Feb 3-5 May**				**X**	
Public Private Partnership & Procurement		15	Block			**X**			
Financial & Economic Management		15	Block		**21-22 Aug. 23-25 Oct.**				**X**
Project Leadership and the Environment		15	Block		**23-25 Aug. 26-27 Oct.**				**X**
Project Management		15	Block	**3-7 April**				**X**	

[1] *The CMP is an extremely intensive high level management course of 4 weeks, offered annually. A substantial course fee applies also to registered postgraduate students. Admittance for Degree purposes subject to special selection criteria.*

Course Module Title and Number	Previous Code	SAQA Credits	Format	Availability per Semester					
				2017		2018		2019	
Geotechnical Engineering : (jmyburgh@sun.ac.za)				**1**	**2**	**1**	**2**	**1**	**2**
Applied Geomechanics 811	G03	15	Block						
Advanced Geotechnics 811	G04	15	Block	**3-7 April**					
Advanced Foundation Design 811	G01	15	Block	**15-19 May**					
Soil Behaviour 841	G02	15	Block	**13-17 March**					
Pavement Engineering : (jmyburgh@sun.ac.za)				**1**	**2**	**1**	**2**	**1**	**2**
Advanced Bitumen Technology 811	P08	15	Block	**18-21 April**					
Flexible Pavement Design 841	P02	15	Block	**23-27 Jan**					
Pavement Construction 841	P03	15	Block						
Pavement Evaluation & Rehabilitation 811	P06	15	Block						
Pavement Management Systems 841	P05	15	Block		**28 Aug. - 1Sept.**				
Pavement Materials I 811 (Granular & Cemented)	P01	15	Block						
Pavement Materials II 811 (Asphalt)	P04	15	Block						
Pavement Materials III 811 (BSM-foam/emulsion)	P09	15	Block						
Rigid Pavement Design 811	P07	15	Block						
Structural Engineering : (natalies@sun.ac.za)				**1**	**2**	**1**	**2**	**1**	**2**
Probability and Risk Analysis in Civil Engineering 811	MT02	15	Semester			As required / On demand			
Continuum mechanics and finite element methods 841	MT04	15	Semester						
Structural Dynamics 811	MT11	15	Semester						
Advanced Structural Steel Design 811	MT12	15	Semester						
Advanced Structural Concrete Design 811	MT13	15	Semester		**17-19 Jul 28-29 Aug**				
Seismic Design of building structures	MT14	15	Block						
Advanced Mechanics of Materials and Modelling	MT05	15	Semester		As required / On demand				
Structural Optimization		8	Block						
Cement-based Materials		15	Semester						

Course Module Title and Number	Previous Code	SAQA Credits	Format	Availability per Semester					
				2017		2018		2019	
Transportation Engineering : (mahsa@sun.ac.za)				**1**	**2**	**1**	**2**	**1**	**2**
Geometric Road Design 811	T01	15	Block			x			
Public Transport 841	T02	15	Block		6-10 Nov.			x	
Traffic Engineering 841	T03	15	Block	29 May-2 Jun				x	
Traffic Flow Theory 811	T05	15	Block			x			
Transport Economics 811	T07	15	Block	13-17 March				x	
Transportation Planning 811	T06	15	Block				x		
Transportation Safety 811	T04	15	Block				x		
Intelligent Transport Systems 811	T08	15	Block		14-18 Aug.				x
Human Factors in Traffic Collisions		15	Block		4-8 Sept.				x
Water Engineering : (merentia@sun.ac.za)				**1**	**2**	**1**	**2**	**1**	**2**
Hydraulic Structures	W01	15	Block*	16-19 May				x	
Storm Water Hydraulics		15	Block		29 Aug-1 Sep				
Water and Drainage systems	W02	15	Block		x				x
Flood Hydrology	W05	15	Block*				Aug		
Water Resources Analysis and Management	W06	15	Block*		Aug				Aug
Pipeline Hydraulics & Pump station design	W07	15	Block*	7-10 March				x	
Sewer Systems		15	Block*		Jun/Jul				
Water Networks and Services Planning	-	15	Block*				Jun/Jul		
Water and Wastewater Treatment	W08	15	Block	6-8 Feb.				x	
Special Hydraulics	-	15	Block*			x			
Special Hydrology	-	15	Block*						
Introduction to Port Engineering (short courses)	W04	15	Block	22-26 May				x	
Introduction to Coastal Engineering (short courses)	W03	15	Block			x			
Numerical simulation of fluids		15	Semester	x		x		x	

2017 ONWARDS					2017				2018				2019			
TNPA PORT & COASTAL ENGINEERING POSTGRADUATE PROGRAMME					Semester		Semester		Semester		Semester		Semester		Semester	
Module		**Code**	**SAQA Credit**	**Type**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**
Introduction: Coastal Eng. (Short Course)	B+C	*W03-0*	1	Block						*W03-0*						
Coastal Processes & Field Data Collection	C	W03-1	1	Quarter	W03-1				W03-1							
Numerical and Physical Modelling	C	W03-2	1	Quarter		W03-2					W03-2					
Coastal & Port Structures	C	W03-3	1	Quarter			W03-3					W03-3				
Coasts & Ports and the Environment	C	W03-4	1	Quarter				W03-4						W03-4		
Introduction: Port Eng. (Short Course)	B+C	*W04-0*	1	Block		*W04-0*								*W04-0*		
Port Planning and Design	C	W04-1	1	Quarter		W04-1					W04-1					
Port Management	E	W04-2	1	Quarter			W04-2								W04-2	
Port Infrastructure and Equipment	E	W04-3	1	Quarter	W04-3					W04-3						
Dredging and Port Maintenance	E	W04-4	1	Quarter				W04-4					W04-4			
Numerical Simulation of Fluids	E	App.M.	1	Semester	App.M				App.M.				App.M.			

LEGEND:

C = Compulsory Module, E = Elective Module, B = Block

Block course: 1 week full time attendance within the Semester (Port & Coastal students do not attain credits with Block Courses but must attend them)

Module: 6 weeks with one 4-hour lecture/week normally on Tuesday morning (Coastal) or Thursday morning (Port) followed by exam in the 7th week

Modules from other Departments or Faculties

- Full timers and part timers have same module load (no compulsory extra courses for full timers)

- M Eng. (Research) need to pass 5 modules minimum (5 of which are compulsory) + attendance of both Block Courses as prerequisite for submitting thesis.

- M Eng. (Structured) need to pass all 8 modules (4 coastal & 4 port modules) + attendance of both Block courses as prerequisite for submitting a project report.

APPENDIX II: COURSE MODULE SYLLABI

The content descriptions below are arranged alphabetically, first according to specialisation field and then according to module name.

Civil Engineering Informatics

SOFTWARE TECHNIQUES FOR GRAPHS AND NETWORKS 811 (MT09)

- Relational algebra: Logic, set theory, relations with focus on the equivalence and ordering relations, maps, sequences and sorting.
- Data structures: Java storage structures combined with the mathematical structures treated above.
- Graph theory: Adjacency, product, closures (hulls), path algebras.

A block release course on either Geometric Modelling or Computational Management is presented each year on an alternate basis. The particular course that is presented in any year forms an integral part of MT09

SYSTEM DESIGN OF AN OPEN ENGINEERING PLATFORM

The course examines the foundations and the internal structure of an open object-oriented CAD system, the functionality of which underpins many engineering applications. Theoretical aspects of the software system are presented mathematically. Consequently the techniques are to a large extent independent of available information technology. In the tutorials the specific Java code of the open source system CADEMIA (www.cademia.org) is examined in detail. Thus the internal structure of the software system is revealed and can be understood both in theory and application.

Prerequisites: Knowledge of object-oriented methods and their application in Java; Good knowledge in the program M Eng (R) of computer graphics and graphical user interfaces

DEVELOPMENT OF APPLICATIONS BASED ON AN OPEN ENGINEERING PLATFORM

The development of geometry-oriented engineering applications is an awkward task. Coding from scratch is most often too expensive and the use of available CAD systems as a program M Eng (R) and application development environment also has significant drawbacks. The course examines the design of object-oriented engineering applications in the environment of the open engineering platform CADEMIA (www.cademia.org). In the tutorials solutions for specific engineering problems are implemented.

Prerequisites: Knowledge of object-oriented methods and their application in Java; basic knowledge in the program M Eng (R) of graphical user interfaces

Construction Engineering and Management

CONSTRUCTION RISK MANAGEMENT (10851-812)

The course considers construction risks management as experienced by all parties involved in construction projects, including the client (owner), consultant and contractor. Principles of risk management is covered, including identification of risks and compilation of risks registers, risk probability and impact, risk prioritization matrices, assignment and monitoring. Advanced risk management methods such as Monte Carlo analyses are presented. The course includes a presentation of software used in the construction environment.

CONSTRUCTION CONTRACT LAW (10824 – 842)

The course aims to provide delegates with a comprehension of the principles which form the basis of standard construction contracts. It provides the contracts manager with insight to understand contractual relationships and how these are achieved through standard contracts.
The course provides an introduction to contract law with specific reference to the implication of contract law and its application in standard construction contracts.

The course demonstrates how risk is allocated and how contracts relate to the principles applicable to the management of a contract. The shortcomings of standard contracts are pointed out and how these should be addressed at project level. A comparison is drawn between the local standard contracts (GCC and JBCC) and international contracts (FIDIC and NEC). In addition, a module is presented on performance guarantees and dispute resolution.

PPP AND PROCUREMENT (13003-811)

The first part of the course covers the Public Private Partnership (PPP) procurement model. The course provides the basic concepts and characteristics of this procurement model. A South African perspective and history, as well as the legal framework and benefits for PPP in South Africa are included. Case studies provide examples of the applications, advantages and pitfalls of PPP.

The second part of the course addresses other forms of procurement such as design build projects. It also presents the CIDB tender procedures and contract documentation. Writing skills are developed for compilation of tender documents including writing of a clear scope of works. Compilation of other reports is addressed including tender evaluation reports and project proposals.

CONSTRUCTION MANAGEMENT (10821-812)

The course addresses a variety of topics in construction site management which are not covered in the other courses. It includes aspects of labour employment agreements, construction plant management, and project controls (planning and scheduling the project, developing the cost estimate, monitoring project progress and costs, forecasting final costs and schedule results).

Cooperation and coordination between designer and contractor is presented for formulating a conceptual design which includes precast and in-situ concrete options. Schemes and philosophies of organizing a construction site are analyzed and discussed. It also includes topics such as formwork systems and formwork design.

INFRASTRUCTURE ASSET MANAGEMENT (13002-811)

The purpose of this course in Infrastructure Asset Management is to address the management practices required for the implementation and maintenance of municipal infrastructure. The course commences with a background to infrastructure asset management, including the position thereof in the national context. Legislation is addressed as well as available and current strategies for infrastructure asset planning and management. The course includes the methodology for setting up an asset register, and a field exercise is undertaken where participants are exposed to the compilation of an actual asset register.
The course addresses ISO55000 and best practice Infrastructure Asset Management implications in practice. The lectures comprise of modules on asset planning and implementation on institutional level. It addresses the basics of project management as required by managers in local authorities.

Representatives from organizations present the application of asset management on municipal services and on road pavements.

Contents:

- Background to Infrastructure Asset Management
- Asset registers, methodology and data management
- Field exercise compiling date for a register
- Asset planning
- ISO 55000 overview and GFMAM:
  - Asset management concepts and definitions
  - The need for an asset management standard
  - Overview of ISO 55000/1/2
  - The structure of ISO 55001
  - The benefits of ISO 55000/1/2
  - Other supporting documents
- Practical application of AM principles at City of Cape Town
- Principles and application of maintenance management
- Data base principles and development (development of an Access data base)
- Example of infrastructure management : Municipal Services
- Examples of infrastructure management: Road pavements

PROJECT MANAGEMENT

With the global shift towards project-based organisations, project management has become an essential business skill for all successful professional engineers, engineering managers and business executives. Project Management is no longer reserved only for the professional project engineer or manager of large and complex projects. Today, project management skills are used by business and services professionals across the board to get tasks done and projects completed on time and within budgets.

The basic objective of this short course is to introduce the participants to the principles of *project management* and to plan and control projects with the application of time-based planning techniques using computer-aided project management software. The course is focused on practical application, enabling participants to apply techniques immediately.

After covering the theory, the participants are given hands-on experience in the use of Microsoft® Project 2007/2010/2013 during a computer tutorial using real life examples. Throughout the whole short course, ample time is allowed for discussions and participation using practical exercises.
It is expected that the short course participants will be able to use computer software like Microsoft® Windows and Office with reasonable ease.

Course content:

- project identification and project portfolios,
- defining the project environment,
- defining required project manager skills,
- project management organisations,
- the project charter (master plan and action plan),
- work breakdown structures,
- task relationships,
- project scheduling,
- resource allocation,
- project costing and budgeting,
- time-cost trade-offs,

- project risk identification and management,
- creating a winning proposal,
- contracts and procurement management,
- project monitoring and quality control,
- change control and configuration management,
- team leadership and conflict management.
- task prioritising
- time management
- effective project closure and termination
- aspects of Agile/Lean Project Management

FINANCIAL & ECONOMIC MANAGEMENT

The course will be presented from 2017 onwards. It will familiarize participants with the basic theory and practice of financial & economic management. The time value of money and the basic financial discounting formulae will be covered in detail. The course will then specifically focus on non-financial managers/engineers and impart them with the knowledge, understanding and skills of capital budgeting, financial statement analysis, cash flow analysis and the valuation of companies. The key financial drivers of company value will also be analyzed and discussed.

PROJECT LEADERSHIP AND THE ENVIRONMENT

The course will be presented form 2017 onwards. It will provide an overview of the nature and extent of the current regulatory environment in the South African Construction Industry. It will identify the parties responsible for regulations in the construction industry, purpose of legislation/regulations and will elaborate on basic performance standards required by legislation/regulations. The implications of the regulatory environment for the construction industry will be addressed.

The course will also address aspects of human resource management, team management and leadership. Motivation of teams and team composition will be addressed.

CONSTRUCTION MANAGEMENT PROGRAMME (CMP) 811

CMP website for details: www.cmp.sun.ac.za

The CMP is a middle management programme for engineers and other practitioners who have the potential for advancement into corporate management. Due to dramatic changes and degree of uncertainty in the business environment it is also a most relevant (if not essential) professional development programme.

The relevance of the programme to the industry and the country is one of the primary reasons why senior managers and other professionals enrol in the programme.

In the context of the CMP, the construction sector includes client and owner organizations, consultants, designers, project managers and contractors.

The CMP has an international reputation for excellence, established over many years. It was first presented in 1976 and has been in constant demand despite periodic lower levels of investment in construction and reduction in capacity this past decade.

The CMP is presented annually (or bi-annually) over a period of four weeks using the total emersion learning methodology to expose delegates to the very latest theories, tools and techniques in all aspects of business management in the construction sector.

An extended list of high profile international and South African speakers participate in the presentation of the programme.

Geotechnical Engineering

APPLIED GEOMECHANICS 811 (G03)

Slope stability: analytical methods and techniques, soil and site investigations, remediation of unstable slopes. Soil reinforcement: applications in fills and retaining structures. Earth fill dams: design considerations, foundation and material investigation, modes of failure, pore pressure and deformation, stability analyses, permeable foundations, rock foundations. Deep excavations: stability considerations, groundwater control, open excavation, vertical support, basement construction, soil movement.

ADVANCED GEOTECHNICS 811 (G04)

Basic Reliability Concepts and SANS 10160:2010 realibility background, calibration of partial factors, background to SANS 10160:2010; Geotechnical uncertainties: soil property uncertainties, model uncertainty, treatment of uncertainties, Ground investigations: overview of ground inspection practices in SA, Selection of design parameters: characteristic value of geotechnical parameters, statistical methods; Introduction to SANS 10160-5: Basis of geotechnical design and actions; Analysis and limit state design of shallow foundations; Analysis and limit state design of pile foundations; Analysis and limit state design of retaining walls.

FOUNDATION DESIGN 811 (G01)

Geotechnical investigations; residual soils in South Africa; serviceability, damage and limiting settlements; bearing capacity and allowable stresses for shallow foundations; elastic settlements; consolidation settlements; soil as elastic plastic material; settlement of normally consolidated clays (soft clays); settlement of sands; mat or raft foundations; soil structure interaction; computer applications.

SOIL BEHAVIOUR 841 (G02)

Clay mineralogy and its determination, the clay-water electrolyte system; fabric of coarse and fine soil and its determination; fundamental properties of fine-grained soils; fabric stability, sensitivity, dispersivity, property anistropy, and collapse behaviour; compressibility and the effects of fabric; shear strength and deformation, the effects of fabric, residual strength, creep and stress relaxation; compaction, fabric of compacted soils, field compaction, special techniques, compaction of organic materials and of clay barriers.

Pavement Engineering

ADVANCED BITUMEN TECHNOLOGY 811 (P08)

Crude sources and characteristics (global and local); Bitumen types and composition; Classification of bitumen grades; Trends in bitumen specifications (Performance grading); Bitumen Rheology; Black diagrams; Master Curves; Engineering properties of bitumen; Polymer modification; Performance testing; Quality control and monitoring; Warranty systems; Health Safety and the environment.

FLEXIBLE PAVEMENT DESIGN 841 (P02)

Fundamentals of three-dimensional stresses and strains as a basis for the structural design of road pavements. Development of pavement design systems with consideration of traffic loading, function and service level, foundation and material characterization, environmental impact, design strategies and

criteria, structural analyses. Consideration of response and distress criteria, performance and deterioration modelling, constructability, maintenance and rehabilitation, economic considerations and optimisation of appropriate pavements for Southern Africa.

PAVEMENT CONSTRUCTION 841 (P03)

Contract documentation. Road works including plant requirements, blasting, crushing. Earthworks including mass-haul diagrams. Standard specifications (COTO) and project specifications. Quality control and acceptance control with emphasis on statistical procedures, including background and application. Production and construction of hot-mix asphalt, special mixes (thin and ultra-thin surfacing), additives and modifiers. Construction of surface seals. Preventative and corrective maintenance, recycling (in-plant and in-place; cold and hot), overlay construction, labour intensive methods. Product Performance Guarantee systems. New roles of road construction industry partners.

PAVEMENT EVALUATION AND REHABILITATION 811 (P06)

Pavement materials, design principles and methods refresher. Functional/structural: pavement distress approach (including roughness and friction). Performance of pavement types. The rehabilitation process (TRH12). Functional/structural evaluation. Network and project level evaluation. Condition surveys: visual inspection and use instruments. Condition assessment (TMH9): performance criteria for the evaluation of pavements. Drainage evaluation.

Sub grade and pavement materials evaluation. Traffic loading evaluation. Structural evaluation using non-destructive testing. Deflection measurement, analysis, interpretation and application. Rehabilitation design of flexible pavements. Pavement overlay design. Recycling. Empirically and theoretically derived rehabilitation approaches used in SA. Economic Analysis. Accelerated Pavement Testing. Surface rehabilitation techniques for flexible pavements, including construction aspects.

PAVEMENT MANAGEMENT SYSTEMS 841 (P05)

Pavement systems, monitoring of distress and deterioration, establishment of appropriate performance models and limiting criteria. Validation of design methods, diagnostic methods. Rehabilitation design. Pavement Management systems, tools and methods for data acquisition, visual inspections, use of functional and structural measurements, maintenance and rehabilitation strategies, economic analysis including road user costs, prioritisation and optimisation procedures, program M Eng (R) and case studies. In addition, specifically for Gravel Road Management: Structural capacity; Basic material properties and gravel performance modelling; Soil stabilizers; Visual condition assessment; Pavement condition description; Appropriate maintenance measures; HDM for unsurfaced Road Management; Borrow pits and environmental issues.

PAVEMENT MATERIALS I 811 (GRANULAR & CEMENTED) (P01)

The use of natural and crushed soils and rocks as road foundation and layerworks in pavement structures. Relevant climatic considerations and problem areas. Compaction theory, practise and laboratory versus field considerations. Laboratory and field testing of materials that are processed, modified, stabilized or cemented. Engineering and behavioural characteristics – environmental and loading considerations. Case studies including diagnostic investigations. Inclusion of latest practise – local and relevant international trends.

PAVEMENT MATERIALS II 811 (ASPHALT) (P02)

Rheology of bituminous binders and mixes related to performance. Bitumen refining and chemical properties, tests and specifications (standard and modified binders). Emulsion and foamed bitumen. Aggregate production, sampling, composition (mineralogy), physical properties. Asphalt composition for base and surfacing, thin and ultra-thin mixes, hot and cold mixes, spatial considerations and volumetrics,

mix design (with examples), special mixes. Material properties important for structural and functional design. Factors influencing the performance of seals, selection of binder, seal design and material specifications. Thin layer technology.

PAVEMENT MATERIALS III 811 (BITUMEN STABILISED MATERIALS) (P09)

Base bitumen binders and characteristics; Foamed bitumen characteristics; Bitumen emulsion characteristics; Emulsifiers; Aggregate selection and suitability; Marginal materials; Mix design of cold bituminous mixes; Curing; Compaction; Mix volumetrics and spatial composition; Performance of cold mix; (laboratory, APT, LTPP); Pavement Design with BSMs (CIPR); Construction issues; Slurries.

RIGID PAVEMENT DESIGN 811 (P07)

Fundamentals of Concrete Pavement Types and Behaviour, Concrete Mix Proportioning and Design Modes of Failure, Supporting layer behaviour, Westergaard Subgrade, Slab Analysis, Slab Support Theory, Environmentally Induced Behavioural Characteristics, Curling and Warping Stresses, Concrete Specifications, Durability, Traffic Characterisation, AASHTO Design Procedure, Mechanistic Design including FEM, South African Mechanistic Design, Reliability, Concrete Pavement Rehabilitation.

Structural Engineering

ADVANCED STRUCTURAL CONCRETE DESIGN 811 (MT13)

Course contents to be announced or enquire at Secretary, Structural Engineering (natalies@sun.ac.za).

ADVANCED STRUCTURAL STEEL DESIGN 811 (MT12)

Design of industrial and commercial steel structures to SANS 10162-2005; design of plate girders, crane girders and overhead travelling crane support structures subjected to fatigue loading.

CONTINUUM MECHANICS AND FINITE ELEMENT METHODS 841 (MT04)

This course presents computational methods for the static analysis of structures, using finite elements. Preliminary basic knowledge of the finite element method would be useful but is not required. A good foundation in matrix and vector algebra and mathematics in general is crucial. Program M Eng (R) exercises in MATLAB allow the student to explore the concepts presented and test their understanding. Basic understanding of program M Eng (R) (not necessarily in MATLAB) will help.

- Tensor algebra
- Strain and stress measures
- Linear elasticity
- Discretisation of differential equations using Galerkin's method
- Displacement based beams, membranes and volume elements
- Introduction to plates and shells
- Gauss-quadrature and Iso-parametric elements
- Contragredient transformations
- Introduction to non-linear analysis (Newton-Raphson)
- Analysis failure and sources of errors

PROBABILITY AND RISK ANALYSIS IN CIVIL ENGINEERING 811 (MT02)

- Overview of fundamental probability theorems
- Probability models including extreme value distributions
- Joint variables, functions of variables, Markov chains
- Decision analysis, utility criteria, design choices
- Reliability and risk analysis of engineering elements and systems
- Regression analysis, hypothesis tests
- Simulation

- Analysis of variation, experimental design
- Bayesian decision theory:
  - Bayes' formula
  - Parameter estimation
  - Bayesian probabilities and decision theory.

STRUCTURAL DYNAMICS 811 (MT11)

This course presents computational methods for the dynamic analysis of structures. A basic understanding of static analysis of structures is necessary. Knowledge of finite element methods is *not* a prerequisite but will be helpful. Students can take MT11 in one year and MT04 in the following year. Complex and Fourier analysis are introduced in the course, but a good foundation in matrix and vector algebra and mathematics in general is crucial. Program M Eng (R) exercises in MATLAB allow the student to explore the concepts presented and test their understanding. Basic understanding of program M Eng (R) (not necessarily in MATLAB) will help.

Theory

- Dynamic equilibrium equations for linear discrete systems
- Complex numbers
- Steady state harmonic response
- The single degree of freedom oscillator, resonance
- Multiple degrees of freedom, transfer function
- Modal analysis
- Simplified models for low damping, diagonalisation
- Systems with high damping or non-proportional damping
- Fourier analysis, continuous and discrete *(Continues on next page)*

(Structural Dynamics 811: Continued from previous page)

- Frequency domain analysis
- Introduction to stochastic analysis
- Time domain analysis: Newmark's method

Applications

- Machine vibration
- Codified earthquake analysis

ADVANCED MECHANICS OF MATERIALS AND MODELLING (AMMM)

The objectives of this course are to:

- Describe fundamental phenomenology of various types of mechanical material behaviour
- Develop an understanding of the mechanisms of elastic, as well as non-elastic deformation of construction materials. Physical mechanisms of non-elastic deformation, including dislocation leading to plasticity in metals, micro-cracking and fracture in brittle materials like concrete, visco-elasticity …
- Study and learn to apply models in continuum mechanics to describe elastic deformation, as well as non-linear deformation via methods of continuum visco-elasticity, plasticity, damage and fracture mechanics.
- Introduce numerical methods to solve above mentioned models of mechanics for structures with complex geometries, as an introduction to Computational Mechanics.
- Understand background and enable sound application of existing models included in design codes.

Course pre-requisites

A command of strength of materials and structural mechanics, linear algebra, and finite element methods is required. This would normally (but not exclusively) require an appropriate undergraduate BSc (Eng) degree in Civil (structural) engineering, or equivalent and completion of MT04 or a similar course in the finite element method.

Transportation Engineering

GEOMETRIC ROAD DESIGN 811 (T01)

Traffic and capacity, design criteria, sight distance, horizontal alignment, vertical alignment, cross-section elements, drainage, intersections, interchanges, pedestrians and cyclists.

PUBLIC TRANSPORT 841 (T02)

The role of public transport in the community, system components, integration and co-ordination of different modes, technological status, liaison problems, terminal requirements, costs, effect on the environment and the economy, legislation, management, operation and control.

TRAFFIC ENGINEERING 841 (T03)

Capacity and level of service analysis of roads and intersections, traffic characteristics, traffic surveys: volumes and speed, traffic growth, parking studies, traffic impact studies, access management.

TRAFFIC FLOW THEORY 811 (T05)

Traffic characteristics, traffic flow studies, traffic flow interaction, traffic flow analysis, intersections, simulation.

TRANSPORT ECONOMICS 811 (T07)

Road economics, road transport costs, financing of road projects, transport investment, cost-benefit analysis, project analysis, shadow prices, transport policy, urban transport economics.

TRANSPORTATION PLANNING 811 (T06)

Overview of the process, demand estimation, surveys for transportation studies, trip models: trip generation, trip distribution, modal split, trip assignment, road networks, public transport networks, public participation, land use forecasts.

TRANSPORTATION SAFETY 811 (T04)

Road design, construction and maintenance, operations, public transport, pedestrian safety, vehicle safety, safety analysis, accident statistics, before-and-after studies, accident costs, economic evaluation, safety programmes, legislation, law enforcement, safety administration, road safety audits.

Water Engineering

DESIGN OF (LARGE) HYDRAULIC STRUCTURES

Project planning and site selection, foundation and construction materials, embankment dams: earth fill, embankment dams: rock fill, concrete & rollcrete dams, masonry dams, hydraulic design of flow gauging weirs, SANCOLD Dam design floods and freeboard requirements, hydraulic design of spillways and outlet works, Hydraulic design of stilling basins and energy dissipators, reservoir sedimentation, dam safety and monitoring, dam rehabilitation, construction of small dams, dam management; Hydropower project and Environmental aspects,

FLOOD HYDROLOGY

General

- Monitoring the processes of the hydrological cycle
- Catchments as impacted systems
- Philosophy of hydrological design

Design Flood Determination

- Empirical methods
- Probabilistic analysis
- Deterministic methods
- Flood routing
- Problems of large catchments
- Dam safety procedures
- Urban stormwater modelling
- Environmental water requirements
- River system planning concepts

STORM WATER AND DRAINAGE SYSTEMS

- Urban drainage and sustainable designs
- Stormwater modelling and management
- Floodlines and flood hazards
- Road drainage
- River bank erosion protection
- Culverts and bridge hydraulics
- Hydrodynamic modelling of flood levels and routing

SPECIAL HYDRAULICS

Course contents to be announced or enquire at Secretary, Water Engineering (merentia@sun.ac.za).

SPECIAL HYDROLOGY

Course contents to be announced or enquire at Secretary, Water Engineering (merentia@sun.ac.za).

PIPELINE HYDRAULICS AND PUMPSTATION DESIGN 841

- Pipe flow theory, pipe material & hydraulic roughness, secondary losses and pipe ageing
- Municipal water demand, peak flows, guidelines and the impact of Water Demand Management
- Pipe material selection: PVC, HDPE, concrete, steel pipes, etc.
- Hydraulic Pressure Transients in pipelines
- Pipeline design considerations
- Air valves & design principles
- Pipeline corrosion causes & mitigation
- Design of river abstraction works: Theory and case studies
- Pump selection and high lift pump station design
- CFD modelling to inform pump station design
- Environmental considerations during pipeline design and construction
- Control Valves: pressure, flow rate, water level, etc.
- Pipeline surveillance & rehabilitation

WATER AND WASTEWATER TREATMENT

To provide the latest and most relevant theory on Water & Wastewater treatment. Application of the theory in practise, the latest technology, the latest government legislation, as well as practical application of the theory in the maintenance and operation of water & wastewater treatment works.

- The National Water Act and Water Services Act
- Theory of wastewater treatment and Water treatment
- Theory and application of external metrification
- Package plants
- Membrane technology
- Operation and maintenance
- Environmental impact assessment procedures and legislation

WATER NETWORKS AND SERVICES PLANNING

The objective of this course is to provide the latest information regarding water network planning and modelling, incorporating the hydraulics, design, construction and maintenance of all **piped water networks.** The focus of the course is on urban services, demand estimation and hydraulic analysis. The course is presented biennially. Specific sessions covered in the course include:

- Hydraulics of flow in closed conduits
- Demand modelling
- Pipe network modelling and design
- Residential end-use modelling
- Water pressure and pressure management
- Pipes and pipe materials
- Practical considerations and case studies
- Water network master planning
- Environmental issues
- System rehabilitation
- Operations and maintenance
- Water demand management and water conservation

This course also provides the latest information regarding sewer systems, their planning and design. The objective is to move Participants towards more effective planning, design, construction

and maintenance of **sewer systems.** The focus of the course is on waterborne sewer systems and the latest technology with regards to this component of urban drainage. Topics addressed include pipes, modelling, hydraulics, pumps and practical challenges pertaining to sewers and sewer flow in pipes. Most of the sessions cover municipal sewers, although bulk sewers and general topics such as management are also addressed. The course is a presented biennially. Specific sessions covered in the course include:

- Hydraulics of sewer flow in pipes (partially full pipe flow)
- Sewer network planning and design
- Sewer flow estimation
- Domestic point-of-use wastewater discharges
- Sewer system modelling
- Alternatives to conventional sewers, including vacuum sewers and solids-free sewers
- Trenchless technology and rehabilitation
- Reuse of sewerage and grey water
- Case studies and practical implications
- Sewer pumps and rising mains
- Sewer pipes and pipe materials
- Handling insoluble matter in sewerage flow, including sand traps

WATER RESOURCES MANAGEMENT

- Water balance in catchments
- Demand projection in catchments
- Modelling runoff generation in catchments
- Estimation of impacts of stream flow reduction activities
- Storage/yield/reliability concepts
- System analysis modelling
- Water quality

INTRODUCTION TO COASTAL ENGINEERING 841 (W03)

(5 day block course [May every second year])
Block course/seminar to serve as introduction to wave mechanics & wave climate, coastal processes, field data collection and analysis, numerical & physical modelling, the coast, ports & the environment. Case studies and a laboratory visits are included.

COASTAL PROCESSES & DESIGN, FIELD DATA COLLECTION & ANALYSIS (W03-1)

- Water wave mechanics
- Coastal morphology and sediment transport
- Tides, currents and wind
- Wave, wind and current recording and analysis

NUMERICAL & PHYSICAL MODELLING (W03-2)

- Physical modelling scale laws, techniques and case studies
- Numerical modelling of waves, sediment transport, flows, water levels
- Introduction to MIKE21, SWAN and DELFT3D Coastal modelling packages
- MUD processes
- Design of beaches
- Long wave and ship motions

COASTAL & PORT STRUCTURES, DESIGN (W03-3)

- Wave run-up, overtopping, reflection and transmission
- Rubble mound and vertical breakwaters
- Piled structures, including open coast mooring jetties
- Groynes for coastal protection
- Quay walls
- Design of ocean effluent outfalls
- Scour

COASTS, PORTS & THE ENVIRONMENT (W03-4)

- Integrated coastal zone management
- Water quality
- Dilution and dispersion of effluent
- Environment impact assessment
- Port pollution control
- EIA case studies

INTRODUCTION TO PORT ENGINEERING 811 (W04)

(5 day block course [May every second year])

Block course/seminar to serve as introduction to merchant shipping, port and terminal planning (including port simulation), port design, management and maintenance (including maintenance dredging), wave climate, numerical & physical modelling and case studies. A laboratory visit is included.

PORT PLANNING & DESIGN (W04-1)

- Breakwater and access channel layout
- Turning areas and mooring areas layout and dimensions
- Port simulation to assist in port planning
- Port planning
- Port design (container, general cargo, ro-ro, liquid bulk, dry bulk and fishery terminals)
- Small-craft harbour design

PORT MANAGEMENT (W04-2)

- Port cargo development
- Port cargo handling operation
- Berth occupancy
- Assistance to be provided by ports to ships
- Ports as link in cargo handling chain
- Port pricing
- Economic appraisal of ports and optimisation of cargo throughput

PORT INFRASTRUCTURE AND HANDLING EQUIPMENT (W04-3)

- Shipping and ship sizes
- Cargo handling equipment for marine terminals
- Hinterland infrastructure (including heavy duty port paving)
- Cargo link with rail and road to industry
- Dry docks design for ship repairs
- Fenders
- Aids to navigation

DREDGING AND INFRASTRUCTURE MAINTENANCE (W04-4)

- Floating dredging equipment, operation and environmental constraints
- Sand bypassing systems
- Breakwater monitoring and maintenance
- Capital, maintenance and mud dredging
- Physical impacts of dredging
- Hydrographic, sub-bottom and sidescan sonar surveys
- Marine measurements (waves, currents and winds)

FOUNDATION DESIGN G01

For contents, refer to Foundation Design under “Geotechnical Engineering”, Appendix II above

NUMERICAL SIMULATION OF FLUIDS TW888

For contents, refer to Numerical Simulation of Fluids under Appendix III below

APPENDIX III:
COURSE MODULE SYLLABI FOR MATHEMATICS AND APPLIED MATHEMATICS

Modules are arranged alphabetically according to module name.

Mathematics and Applied Mathematics

LINEAR ALGEBRA 38571814

Host: Division of Mathematics, Department of Mathematical Sciences, Faculty of Science
Quadratic forms, positive definite matrices, matrix norms; perturbation theory; special matrices (symmetric, band sparse); least squares; Householder reflections and Givens rotations; iterative methods for linear equations, including conjugate gradient and multi-grid methods.
Please contact Prof D Laurie of the Division of Mathematics regarding module content and availability: dpl@sun.ac.za

PARTIAL DIFFERENTIAL EQUATIONS 20753834

Host: Division of Applied Mathematics, Department of Mathematical Sciences, Faculty of Science
Difference methods for parabolic, hyperbolic and elliptic partial differential equations.
Please contact Dr Karin Hunter of the Division of Applied Mathematics regarding module content and availability: karin@sun.ac.za

NUMERICAL SIMULATION OF FLUIDS TW888 - 62820 888

General numerical methods for solving flow equations; finite difference/volume methods; procedures for the simulation of diffusive and convective processes; boundary values; solvers such as the SIMPLE range of algorithms; solving of introductory problems on computer.

Host: Division of Applied Mathematics, Department of Mathematical Science, Faculty of Science.
Please contact Dr GJF Smit of the Division, Department of Applied Mathematics regarding module content and availability: fsmit@sun.ac.za

POROUS MEDIA TW891 – 62839 891

Differential and integral calculus of volume averages in two phase media and its use in the mathematical modelling of transport processes in porous media; the rectangular unit cell model.

Host: Division of Applied Mathematics, Department of Mathematical Science, Faculty of Science.
Please contact Dr JP du Plessis of the Division, Department of Applied Mathematics regarding module content and availability: jpdp@sun.ac.za

SERIES SOLUTION OF PARTIAL DIFFERENTIAL EQUATIONS TW832 - 53783 832 (OLD: TW03)

Fourier series applied to the solution of partial differential equations. Frobenius method, Bessel functions for ordinary differential equations.

Host: Division, of Applied Mathematics, Department of Mathematical Sciences, Faculty of Science
Please contact Dr M Maritz, of the Division of Applied Mathematics regarding module content and availability: mfmaritz@sun.ac.za

Memo

ENQUIRIES

ADMISSION, REGISTRATION AND GENERAL ACADEMIC ENQUIRIES			
Position and function	**Name**	**Tel. No.**	**E-mail**
Chairman: Department of Civil Engineering - General academic matters	Prof JA du Plessis	+27-(0)21-808 4358	jadup@sun.ac.za
Administrative Officer: Postgraduate Studies - Application for admittance: http://web-apps.sun.ac.za/eAansoek2/alg.jsp?Tl=1 www.sun.ac.za/pgstudies	Mrs AJ de Wet	+27-(0)21-808 4404	amandadw@sun.ac.za
Faculty Secretary - Registration and fees	Mrs N Hartzenburg	+27-(0)21-808 4835	nicolepa@sun.ac.za
Departmental coordinator for Postgraduate studies	Dr M de Wet	+27-(0)21-808 4350	Mdw1@sun.ac.za
International Office: Applications by all foreign students http://www0.sun.ac.za/international/	Ms C de Doncker	+27-(0)21-8082566	cnm@sun.ac.za interoff@sun.ac.za
FIELD OF SPECIALISATION, RESEARCH PROGRAMMES, RESEARCH FUNDS			
Division of Water Engineering, Port and Coastal Engineering	Prof GR Basson	+27-(0)21-808 4355	grbasson@sun.ac.za
Division of Transportation and Geotechnical Engineering	Prof M Sinclair	+27-(0)21-808 3838	msinclair@sun.ac.za
Division of Structural Engineering and Civil Engineering Informatics	Prof GPAG van Zijl	+27-(0)21-808 4436	gvanzijl@sun.ac.za
Division of Construction Engineering and Management	Prof JA Wium	+27-(0)21 808 4348	janw@sun.ac.za

ADDRESS:

Postal Address:
Department of Civil Engineering
University of Stellenbosch
Private Bag X1, Matieland,
STELLENBOSCH, 7602,
South Africa

Physical Address:
Department of Civil Engineering
University of Stellenbosch
Banhoek Road
7600, STELLENBOSCH,
South Africa

Civil Engineering Homepage: http://www.civeng.sun.ac.za

University of Stellenbosch: http://www.sun.ac.za
Engineering Faculty: http://www.eng.sun.ac.za

CHANGES IN THIS BROCHURE

- **Important dates: Academic Calendar for 2017**
- **Appendix I (Schedule for Course modules)**
- **Admissions and Pass requirements for the PDE Programme (BTech students – PDE programme – 4.1.1)**
- **Port and Coastal Engineering (section 2.5.7)**
- **Port and Coastal Engineering Section 6.3.8**
- **Enquiries table**
- **Appendix II: Construction Engineering and Management**
- **Sunscholar Copyright permission (section 2.2 and 5)**