

Division of Structural Engineering and Civil Engineering Informatics

MEng Research: Topics available in 2018

You are welcome to discuss the topics with the lecturers by email correspondence:

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No	Lecturer	Preliminary title of research project	Brief description of project	Research material expenses	Workstation and internet costs
H1	Dr T Haas	Resistance of fuel reservoirs to earthquake loading	Some areas in the Western Cape are at risk to natural seismicity. The fuel reservoirs at Milnerton refinery each have a capacity of approximately 20 million litres. These fuel reservoirs are considered a strategic resource. Should failure of 1 of these fuel reservoirs occur, it could result in a catastrophe not only for the plant but also have severe consequences on the businesses which heavily rely on fuel in the Western Cape.	Covered	none
H2	Dr T Haas	Evaluation of the new seismic loading code of practice	The new code of practice for the analysis of civil engineering infrastructure was recently approved for use. Many civil engineering professionals had problems using the previous code of practice. The purpose of this investigation is to determine how practicing engineers are embracing the new code of practice.	Covered	none
H4	Dr T Haas	Ultimate load prediction of CFDST columns subjected to eccentricity and / or eccentric inner tube	Concrete Filled Double Skin Tubular columns can be used to enhance the construction process and is also viable alternative in seismic prone areas. The aim is to develop a generic FE model to accurately predict the ultimate load capacity of these sections when subjected to eccentric loading.	Covered	none
R1	Dr G van Rooyen	Informatics	Optimisation of structural systems – Details to be defined in cooperation with the student	None	None
R2	Dr G van Rooyen	Informatics	Optimisation approach to project scheduling, resource allocation and management – Details to be defined in cooperation with the student	None	None
R3	Dr G van Rooyen	Informatics	Software models for structural analysis / design / reliability – Details to be defined in cooperation with the student	None	None
L1	Dr R Lenner	Dynamic amplification	The interaction between a heavy vehicle and bridge is important in terms of the total action effects. There are different values specified in different international design codes for normal traffic. It is however not clear how to approach dynamic amplification locally for existing bridges. Thorough investigation of dynamic effects is necessary.	none	none
L2	Dr R Lenner	Probabilistic fatigue load model for bridges	The fatigue is still some of the less known phenomena. The research is applicable to reinforced concrete structures in South Africa. The current provisions are largely based on the Model Code and it is not entirely clear how applicable they are. In addition to investigation of the current models it is necessary to cyclically test reinforcing bars in order to deliver a stochastic S-N model.	none	none
L3	Dr R Lenner	Reliability verification of bridges in South Africa	It is unclear what reliability level can be expected from the bridges designed according to the TMH-7. It is proposed to investigate the current heavy traffic, establish loads effects and calculate the resulting probability of failure.	none	none

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AS1	Mr AS van Rooyen	Dimensional stability of foamed concrete	Investigate the short term and long term deformations in foamed concrete	none	none
UCM	For more information on the UCM (Unit for Construction Materials), click here: www.sun.ac.za/ucm				
UCM1	Prof WP Boshoff	Fabric Formed Concrete	Fabric Formed Concrete is a novel and modern approach to concrete shutters. Current production of concrete beams are limited to prismatic elements due to the limits of construction technology. Using fabric to shape the elements allows for optimised sections which is also more environmental friendly due to using less concrete and still give the same strength. Using this technology in combination with fibre reinforced concrete (FRC) has not been done before. This study will use FRC to reinforce fabric formed concrete elements. This work will include a large experimental programme. www.sun.ac.za/ucm	Covered	Provided
UCM2	Prof WP Boshoff	Using Waste Materials in Concrete	The production of cement has a significant negative impact on the environment. Some scholars believe cement production contributes as much as 7 % of the world carbon emissions. This project will look at common waste materials to replace a part of cement. This includes recycled clay bricks, recycled glass, bagasse ash etc. www.sun.ac.za/ucm	Covered	Provided
UCM3	Prof WP Boshoff	Creep of cracked Textile Reinforced Concrete	The UCM is part of a Rilem committee investigating the tensile creep of cracked fibre reinforced concrete (FRC). The creep of Textile Reinforced concrete (TRC) and type of FRC, has still to be investigated. TRC is a relatively thin material which consists of layers of mortar and woven fibre textiles/mats. They have superior behaviour in tension and flexure. This project entails the long term testing of TRC under creep loads. www.sun.ac.za/ucm	Covered	Provided
UCM4	Prof WP Boshoff	Using superabsorbent polymers (SAP) to improve the properties of fresh concrete	Superabsorbent polymers (commonly used in diapers) can store water in concrete and release it when it is needed. This can improve rheology, but more importantly, improve the plastic cracking behaviour. This work entails testing the fresh concrete behaviour with concrete containing SAP and identify the mechanisms whereby these SAP work. www.sun.ac.za/ucm	Covered	Provided

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UCM5	Dr R Combrinck	Rheological concrete properties required for successful concrete placement	One of the main advantages of concrete is its ability to be shaped into any form while in the fresh state. However, defects such as honeycombing, segregation and incomplete compaction still occur during the placement process and have a significant negative impact on the overall cost and durability of any concrete structure. The successful casting and placement of concrete requires a concrete with suitable fresh properties for a specific application. The rheology of concrete provides a more scientific description of the fresh properties of concrete compared to the conventional slump test. This study should investigate the impact of rheology of fresh concrete on the successful casting and placement of numerous conventional and non-conventional concrete mixes.	Covered	Provided
UCM6	Dr R Combrinck	Influence of restraint on the cracking of plastic concrete	The cracking of plastic concrete occurs within the first few hours after concrete has been cast and includes both plastic settlement of plastic shrinkage cracks. The behaviour of these cracks is greatly influenced by the amount of restraint. Restraints include reinforcing steel, formwork and even the concrete itself. However, the influence of restraint on the cracking of plastic concrete is unknown. This study should investigate and propose a link between the type (and amount) of restraint and the severity of plastic cracking.	Covered	Provided
UCM7	Dr R Combrinck	Early age strength development of conventional and non-conventional concrete mixes exposed to different environmental conditions	Modern day concrete structures needs to be constructed quickly and effectively. The concrete must reach a specific strength as fast as possible to allow the stripping of formwork and supporting falsework. However, structural collapses can occur if the falsework is removed before the concrete has reached the required strength. With this in mind, this study should investigate the strength development with time of both conventional and non-conventional concrete mixes at different environmental conditions. This should include a variation in formwork type as well as cement type.	Covered	Provided
UCM8	Dr R Combrinck	Quantifying the effectiveness of preventative measures for the cracking of plastic concrete	The cracking of plastic concrete can result in serious and premature durability issues. However, these cracks can be prevented using preventative measures such as admixtures, fibres, SAP, curing, finishing techniques and casting procedures. These measures are often ineffective due to incorrect application. This study should investigate and quantify the effectiveness of these measures in preventing or reducing the cracking of plastic concrete.	Covered	Provided

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No	Lecturer	Preliminary title of research project	Brief description of project	Research material expenses	Workstation and internet costs
UCM9	Ms W de Villiers	Investigating the structural response of single storey masonry walls built of alternative masonry units	Mechanical limits for conventional masonry units were developed using yield line theory and superseded loading conditions. To assist the development of alternative masonry units, the mechanical demands on masonry units in Category 1 Buildings need to be verified. This is done by producing adequate alternative masonry units and constructing full-scale masonry wall tests in the laboratory, including the simulation of wind and seismic loading.	Covered	Provided
UCM10	Ms W de Villiers	Determining mechanical demands on alternative masonry units for application in Category 1 Buildings	Mechanical limits for conventional masonry units were developed using yield line theory and superseded loading conditions. To assist the development of alternative masonry units, the mechanical demands on masonry units in Category 1 Buildings need to be verified. This is done using finite element analyses, taking into consideration the requirements of SANS 10160, including seismic loading, and the requirements of SANS 10400.	Covered	Provided
Z1	Professor GPAG van Zijl	3D printing of concrete, towards industrialisation	A 3DP for concrete is currently designed and will be ready in 2017. Collaborate with the current MEng-candidate in 2018 on concrete technology for 3DP concrete materials, constructability and characterisation of mechanical properties of 3D printed concrete. Propose finite element modelling strategies specific for 3DPC structures.	Covered	Provided
Z2	Professor GPAG van Zijl	Durability design of repair and retrofitting strategies	Reinforced concrete structures suffering from corrosion or ASR are to be assessed, and repair strategies proposed to restore or extend the original design service life. A durability design is to be performed. Use as an example a cooling tower case study, and propose a retrofitting strategy for an extended design life of 30 years, and 50 years.	Covered	Provided
Z3	Professor GPAG van Zijl and AS van Rooyen	Thermal and acoustic performance of LWFC in 4-storey residential buildings.	Join a research team on lightweight foam concrete for structural application in medium-rise buildings. Studies on durability (carbonation and chloride-induced corrosion), and structural design of precast wall panels for hybrid construction in seismic regions are far advanced. Your contribution is to lay a scientific basis for the thermal and acoustic performance. Design and construction of a small building, to be instrumented for monitoring the internal climate and durability performance, is part of your assignment.	Covered	Provided

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V1	Prof C Viljoen	Derivation of a design wind load map for South Africa	Note: Looking for a PhD student, or MEng[R] student to upgrade to PhD after one year. Description: In SANS 10160-3 (Wind loads) a wind map of characteristic wind speeds are provided for South Africa. A previous PhD study found that a significant portion of total uncertainty derives from the standardised formulation where characteristic wind speed is multiplied by a calibrated partial factor. The alternative is to provide a map of design wind speed instead to reduce total uncertainty. Quantify and compare the uncertainty derived from the current formulation to the alternative, as motivation for future adjustment of the formulation.	Covered	Provided
V2	Prof C Viljoen	Assessment of the economic implication and reliability levels implied by adopting crack width provisions of EN 1992-1-1 for SANS 10100-3.	Note: Looking for a PhD student, or MEng[R] student to upgrade to PhD after one year. Description: Design reinforcement in water retaining structures are often dictated by SLS requirements, i.e. crack control. This study would aim to quantify the level of reliability of current provisions for crack control. Assessment of the economic implications of adopting the more stringent EN2 provisions is also needed. Provide recommendations for South African parameters to be adopted.	Covered	Provided
W1	Dr RS Walls	Development of the Voidcon concrete flooring system considering fire performance	The Voidcon Group have developed a permanent formwork / decking system for concrete slabs and beams. Determine the fire rating of the concrete elements built with this system and investigate how to improve it. Carry out small-scale furnace tests.	Covered	Covered
W2	Dr RS Walls	Design and testing of a novel cellular beam system in fire	The SA Institute of Steel Construction have developed a new cellular beam building system for multi-storey buildings. Determine the resistance of the structure in fire and carry out a full-scale burn test to validate the results.	Covered	Covered
W3	Dr RS Walls	Behaviour of informal settlement shacks in fire	Join an international research team developing fire safety for informal settlements. Carry out full-scale burn tests of specially made shacks. Develop fire spread and burning models. Consider social aspects and influences of the larger problem.	Covered	Covered (subject to grant award)