

Improving transportation through railway engineering knowledge and skills

Transnet currently invests more than R300 billion in infrastructure development to rejuvenate the economy, create jobs and address poverty and inequalities. Of this amount, R201 billion has been assigned to Transnet Freight Rail to expand its rail infrastructure to create capacity and increase cargo volumes.

According to the 2014 Budget Speech, government planned to spend approximately R22.9 billion to upgrade commuter rail services over three years. Rail services would be emphasised, making this the ideal time to upgrade engineers' railway engineering knowledge and skills. With the cooperation of world-class experts, the Faculty of Engineering, Built Environment and Information Technology offers a wide variety of high-quality short courses that will benefit railway engineers.

The Transnet Chair in Railway Engineering in the Department of Civil Engineering relaunched its Introduction to Multi-disciplinary Concepts in Railway Engineering course in January 2015 to celebrate its 23 year-long relationship with Transnet. The course was presented at the Innovation Hub in Pretoria.

Topics such as train authorisation, train vehicle, train track and train traction technology were covered during the week of 26 to 30 January 2015. The relaunch of the course was celebrated with a cocktail function on 29 January, which was attended by course participants and presenters, as well as a number of delegates from Transnet. At the function, Prof Sunil Maharaj, Dean of the Faculty of Engineering, Built Environment and

Information Technology, highlighted the collaboration between the University and Transnet as a sterling example of how academia can serve industry by offering globally competitive courses to meet its needs.

The Transnet Chair in Railway Engineering was established at the University of Pretoria in 1992 with the sponsorship of Transnet Freight Rail. The Chair not only focuses on research and development, but also on graduate training, continuing education and technical support.

The chairholder is Prof Hannes Gräbe, a civil engineer with 20 years' experience in track

technology, track geotechnology, advanced laboratory testing, field investigations, maintenance models and the numerical analysis of track structures.

The Transnet Chair in Railway Engineering has a strong focus on track infrastructure research and is active in the following fields:

- Conventional ballasted and non-conventional track structure performance
- The numerical modelling of track structures and vehicle/track interaction
- Formation failure, repair and investigation
- Standard laboratory testing of rails, fasteners, sleepers and ballast
- The development of track deflection measurement systems
- The development of non-destructive track condition monitoring technologies (for example, ground-penetrating radar)
- Stress and strain measurement systems
- The measurement of stress-free temperature in continuously welded rails
- Track maintenance models
- Maintenance limits and condition monitoring
- Asset management and maintenance management strategies and philosophies



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Tests and laboratory experiments can be conducted in the Civil Engineering Laboratory. Researchers also have access to the Department of Civil Engineering's 30 metre-long railway test track on the University's Experimental Farm. The track structure conforms to heavy-haul track structure design requirements. This project was made possible with the help of civil engineering students and industry sponsorship.

The following topics can be researched at this facility:

- Full-scale stress and strain tests in a controlled environment
- The effect of moisture on the strength of the track foundation under loading
- The evaluation of earthworks specifications under loaded conditions and in different moisture conditions
- The evaluation of different foundation characterisation methodologies and equipment

A special bogie with a total loading capability of 80 tons was manufactured for load application on the test track.

The University of Pretoria salutes Transnet Freight Rail for its far-sightedness in supporting the Transnet Chair in Railway Engineering and looks forward to growing this partnership to the benefit of the rail industry in South Africa. 🌱

→ A variety of tests can be conducted on a test track to monitor track conditions and test stress and strain in a controlled environment.

