

Postdoctoral Research Fellowship

Trackside monitoring technologies for train condition – Gibela Engineering Research Chair in Engineering at Stellenbosch University

Scope of research: Gibela, is a consortium of Alstom and Ubumbano Rail through an agreement with PRASA. The consortium was contracted to deliver 600 modern commuter passenger trains to the South African rail network over the next 10 years. Furthermore, Gibela is tasked with maintenance support for the fleet over a 19-year period in five depots across the country. The Chair at Stellenbosch University is funding research in trackside monitoring applications and asset management technologies for Gibela passenger trains by leveraging the potential of digital twin technology.

Post description: The foremost aim of the advertised post-doctoral position is to establish research into digital services that inform on the condition of Gibela trains in operation. This may entail that rail sections or trainsets are equipped with additional software tools, services, capabilities, and data access which will provide information to manufacturers, maintainers and asset operators to inform decisions about train maintenance. The emphasis of this work will require a balance between applied research that is relevant to industry and research that has academic merit.

As a postdoctoral fellow the incumbent will assist the academics of the Gibela Engineering Research Chair with specific research, technical analysis and student supervision under the academic directive of Prof Annie Bekker at the Department of Mechanical & Mechatronic Engineering. The postdoctoral fellow will be expected to write at least two full-length, peer-reviewed journal articles per year. Funding is available to attend at least one international conference, provided a paper will be presented. The work will entail travel between Stellenbosch University and the Gibela manufacturing plant and depots to perform and oversee monitoring activities. Funding is available for two years over the period 1 January 2023 to 31 December 2024.

The technical areas of interest serve for this position are:

Track-side sensor assembly: A trackside sensor assembly will be assembled to monitor the condition of Gibela trains. It is envisioned that this trackside sensor assembly should be established on the 1.2 km test track section at the Gibela Manufacturing Plant where low speed commissioning tests on newly built trains are carried out. Such sensor systems can be extended to trackside monitors at the Gibela train depots. In this way newly manufactured trainsets can be characterised upon manufacturing and monitored during operation. As such a significant requirement of the advertised position is a competency in mechanical measurements (strain, vibration, optical, thermal).

Signal processing techniques are crucial to extract rich features from monitoring data. The latest literature indicates the use of techniques such as wavelet analysis, empirical mode decomposition and Hilbert transforms in track monitoring applications. The ideal candidate will demonstrate experience and a keen interest in signal processing techniques to elicit features from digital signals that may be used for anomaly detection and fault diagnosis.

Data project for Gibela monitoring data: Monitoring data will be ingested into a database with the associated meta-data. All data will be consolidated and referenced on a purposely maintained server. A background in data engineering or understanding of databases is an advantage. The work will entail collaboration with software and data engineering specialists to select and develop a data model.

Student supervision and leadership: The Gibela brand persona is people centric, optimistic and future focused whilst striving for precision and excellence. The ideal candidate would complement this identity by reflecting enthusiasm for Gibela work, the supervision of students and the creation of a positive and productive work environment.

Host: Prof Anriëtte Bekker, Gibela Engineering Research Chair, Department of Mechanical and Mechatronic Engineering, Stellenbosch University

Requirements:

- A PhD in engineering from a recognised academic university (must have graduated within the last five years), with an applicable thesis/dissertation involving rail or rolling stock / monitoring technology / measurements / signal processing or an applicable field to the advertised position.
- South African citizenship is an advantage.
- Experience in conducting engineering research at an advanced level and publishing in reputable journals and conferences.
- Experience with measurement campaigns, instrumentation and signal processing in the field or laboratory work requiring the use of measurement equipment for vibration and acoustic measurement.
- Excellent command of spoken and written English language.
- At least two journal articles accepted for publication in a peer-reviewed journal.
- Experience in the supervision and study guidance of students.

Please note that postdoctoral fellows are not appointed as employees and are therefore not eligible for employee benefits. Postdoctoral fellowships are also awarded tax free.

Fellowship value: R210k per year for two years.

Commencement of duties: Position available from 1 January 2023.

Closing date: Open until filled.

Enquiries: Send a letter of application, accompanied by a comprehensive curriculum vitae, including a list of publications and the names and contact details of at least two referees, to Prof Annie Bekker at annieb@sun.ac.za

The University reserves the right not to make an appointment.