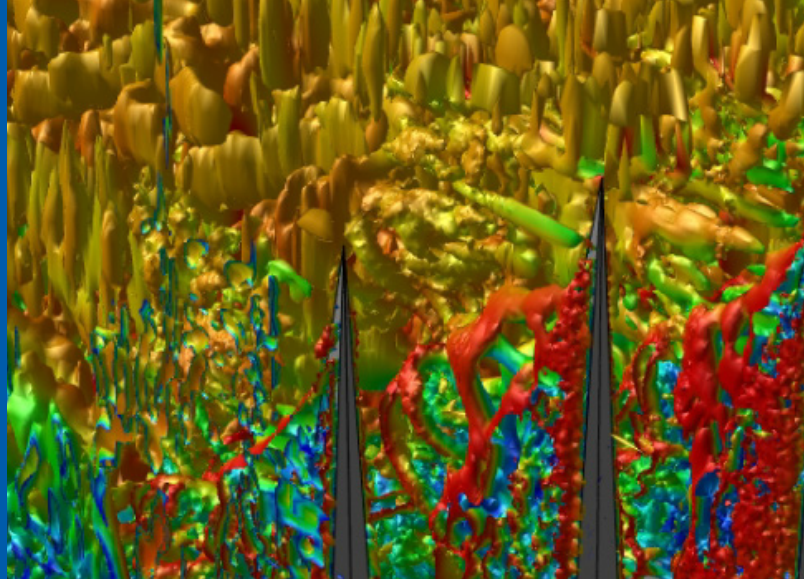
DEPARTMENT OF MECHANICAL AND AERONAUTICAL ENGINEERING

Learn more:
www.up.ac.za/mechanical-and-aeronautical-engineering



KEY RESEARCH IMPACT

EBIT's Department of Mechanical and Aeronautical Engineering has made significant contributions to research in concentrated solar power receivers and systems, new terminology and flow regime maps for flow in the transitional flow regime, improved understanding of boiling and evaporation heat transfer at different length scales, thermal energy efficiency improvement and optimisation, and nanofluids and bio-nanofluids in terms of stability, thermal-fluid behaviour and heat transfer enhancement.

The Vehicle Dynamics Group has developed unique world-leading equipment and methods to parameterise large tyres for off-road vehicles. Testing and development of Collision Management Systems for the mining industry are making a significant impact on reducing mobile equipment-related mining accidents.

In the Centre for Asset Integrity Management, important recent breakthroughs include the development of new online turbine condition monitoring techniques based on blade tip timing, as well as novel methods for vibration monitoring of gears and bearings subjected to variable speed and load conditions.

RESEARCH PRIDE

Research chairs and entities

- Eskom Chair in Plant Asset Management
- Chair in Nuclear Safety and Security
- Centre for Asset Integrity Management
- Clean Energy Research Group
- Vehicle Dynamics Group

South African National Research Foundation (NRF)-rated researchers

- Prof PS Els (B2 NRF-rating)
- Prof PS Heyns (B3 NRF-rating)
- Prof KJ Craig (C2 NRF-rating)
- Prof S Kok (C2 NRF-rating)
- Prof M Sharifpur (C2 NRF-rating)
- Prof J Dirker (C2 NRF-rating)
- Prof DN Wilke (C2 NRF-rating)
- Dr WG le Roux (Y2 NRF-rating)

Industry endorsement

Industry-related research is supported by Airbus, the American Society of Heating, Refrigeration and Air-Conditioning Engineers, the European Research Office of the US Army, EU Horizon 2020 and the Mine Health and Safety Council.

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RESEARCH OPPORTUNITIES

Clean Energy Research Group

The research within this group, under the umbrella theme of clean energy systems and components, is focussed on energy systems, renewable energy (solar-thermal and conversion to mechanical power), nuclear energy, energy efficiency and optimisation, heat exchangers, nanofluids and aerodynamics. Over recent years, there has been a growing research activity surrounding computational methods in the thermoflow field, with applications like electronics cooling and industrial computational fluid dynamics (CFD) gaining ground. The Clean Energy Group is also very actively involved in experimental heat transfer and fluid mechanics research.

Centre for Asset Integrity Management (C-AIM)

C-AIM explores a wide range of aspects pertaining to the structural integrity and performance of physical assets, such as power generation equipment, petrochemical plant, water utility equipment and mining equipment. The Eskom Plant Asset Management Chair forms part of this centre. Engineering assets are increasingly used past their original design lives. This happens in the context of growing safety and environmental concerns, as well as continuous financial pressure. Trends like these require an in-depth understanding of all aspects of the asset management process, and a new generation of engineers and scientists need to be educated with a proper understanding of the asset life cycle and the interdisciplinary nature of this process. This field also creates very exciting new research opportunities in the context of the fourth industrial revolution.

Vehicle Dynamics Group

This research group exposes students to vehicle dynamics and mobility. It promotes the study, understanding and application of vehicle dynamics and mobility nationally and internationally through the South African version of the Baja SAE® competition in collaboration with local industry, encourages research activities through postgraduate studies at postgraduate and postdoctoral levels and facilitates national and international collaboration with other institutions. The objective of its research is the improvement of vehicle safety, occupant safety, comfort, reliability and efficiency. Extensive use is made of experimental, as well as analytical and computational tools and techniques to achieve a deep fundamental understanding of vehicle dynamics.

POSTGRADUATE DEGREE PROGRAMMES (click on each programme to learn more)

Honours programmes

The Department's honours degree programmes prepare students for a career in research through taught modules. However, there is also a strong need for these programmes in industry, without students having to commit to master's degree studies.

BEngHons Mechanical Engineering
BScHons Applied Science Mechanics ■ **BScHons Applied Sciences Mechanics: Physical Asset Management**

Master's programmes

Through the Department's master's programmes, the student initiates, plans and executes a scientific investigation on a mechanical engineering topic and then writes a dissertation on the research project and its findings.

MEng Mechanical Engineering ■ **MSc Applied Science Mechanics**

Doctoral programmes

A doctoral degree in the Department is awarded for a successful thesis on advanced original research that makes a real and substantial contribution to the knowledge of engineering science or practice.

PhD Mechanical Engineering ■ **PhD Mechanics**

Curriculum, rules and regulations: www.up.ac.za/yearbooks/home
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