

## Potential Supervisors (School of MIA)

Academic staff research interests are outlined below. Students interested in applying should contact the responsible person to discuss the current research available.

### Mechanical / Aeronautical Engineering

#### **Dr M Atkins**

Fundamental and applied aerodynamics, flow control, thermofluids in gas turbine engines, thermal-hydraulics in CANDU reactors, particle image velocimetry and planar laser visualization

[michael.atkins@wits.ac.za](mailto:michael.atkins@wits.ac.za)

#### **Mr M Boer**

Aircraft design, aircraft performance estimation, aerobatic tumble-manoevre mechanics, high-speed downhill speed skiing, flow fields around motorcycles in formation during turning and flow visualisation photography.

[michael.boer@wits.ac.za](mailto:michael.boer@wits.ac.za)

#### **Mr T Frangakis**

Bulk materials handling, flow properties of bulk materials, Discrete Element Modelling (DEM), mechanical vibration, simulation of hydro-powered equipment, mechanical design of equipment such as mining machinery.

[terrance.frangakis@wits.ac.za](mailto:terrance.frangakis@wits.ac.za)

#### **Prof W Ho**

Aerodynamics of flapping wings, biomedical engineering especially in the field of biofluids e.g. vascular flow etc., using computational fluid dynamics for industrial applications.

[weihua.ho@wits.ac.za](mailto:weihua.ho@wits.ac.za)

#### **Prof R Reid**

Residual stress measurement techniques, analysis of composite structures and functionally graded materials

[robert.reid@wits.ac.za](mailto:robert.reid@wits.ac.za)

**Prof P Loveday**

Vibration, Acoustics and Ultrasound. Guided Wave Ultrasound for Non-Destructive Evaluation and Structural Health Monitoring. Piezoelectric Sensors and Actuators. Numerical Modelling and Measurement.

[philip.loveday@wits.ac.za](mailto:philip.loveday@wits.ac.za)

**Dr Chioniso Kuchwa-Dube**

Intelligent autonomous mobile robots, aerial robots, robotic manipulators, design of mechatronic systems.

[Chioniso.Kuchwa-Dube@wits.ac.za](mailto:Chioniso.Kuchwa-Dube@wits.ac.za)

**Dr L Nel**

Compressible flows (specifically interactions between supersonic flow phenomena such as shock waves, expansion fans, and vortices) and flow visualisation.

[lara.nel@wits.ac.za](mailto:lara.nel@wits.ac.za)

**Dr R Paton**

Highly transient, compressible gas flows particularly in the field of impulsive motion and vortices, as well as weak shock dynamics and acoustics; computational fluid dynamics modeling and analysis of such gas flows; high-speed comminution and protective clothing development.

[randall.paton@wits.ac.za](mailto:randall.paton@wits.ac.za)

**Mr F Pietra**

FEA (Finite Element Analysis) mechanical simulations: non-linear simulations (large deformation, buckling, contacts), non-linear material simulations (plasticity, hyper-elasticity, creep, etc.), Dynamic simulations (Vibrations and Explicit dynamic), APDL (Ansys Parametric Design Language), thermal simulations. Design (mechanical components/structures), optimization, fatigue (theory, experimental activities and related topics: fretting, residual stresses, fatigue related technologies, etc.), composite welding, laser shock peening, etc.). Helicopter structure topics (main rotor head and tail rotor head design, landing gear design). Design, analysis and manufacturing technologies), innovative manufacturing technologies (friction stir)

[Francesco.Pietra@wits.ac.za](mailto:Francesco.Pietra@wits.ac.za)

**Dr Tiyamike Ngonda**

Sustainable and Renewable Energy Technologies, Metal Forming and Joining

[tiyamike.ngonda@wits.ac.za](mailto:tiyamike.ngonda@wits.ac.za)

**Mr Ronny Tebeta**

Experimental characterisation, numerical and theoretical analysis of Polymer-Based Nanocomposites (PNCs), Glass Fiber-Reinforced Polymers (GFRP) rebars for concrete reinforcement, and natural adhesives. Specific areas are Nanocomposite, Computational Mechanics, Micro Mechanics, Molecular Dynamics, and Finite Element Analysis.

[ronny.tebeta@wits.ac.za](mailto:ronny.tebeta@wits.ac.za)

**Prof C Polese**

Fatigue, Fracture Mechanics and Damage Tolerance analysis of metallic aircraft structures. Conventional and innovative aerospace technologies: Split Sleeve Cold Working, ForceMate, StressWave, Laser Shock Peening, etc., for fatigue life enhancement of metallic components; New welding technologies (Friction Stir Welding, Laser Welding, etc.); Titanium machining and High-Speed Machining. Mechanical testing, Finite Element Analysis and processes optimization.

[claudia.polese@wits.ac.za](mailto:claudia.polese@wits.ac.za)

**Dr H Roohani**

Unsteady compressible fluid dynamics generated by bodies in accelerated motion. Internal combustion engines research with special focus on alternative fuels such as hydrogen and natural gas. Refrigeration and air conditioning systems with special emphasis on solar energy applications in these areas.

[hamed.roohani@wits.ac.za](mailto:hamed.roohani@wits.ac.za)

**Dr S Schekman**

Primarily focus on fluid dynamics and heat transfer with testing in Wind tunnel testing including flow visualization. Turbine blade cooling techniques, aircraft control surfaces, military technology, solar car aerodynamics.

[sjouke.schekman@wits.ac.za](mailto:sjouke.schekman@wits.ac.za)

**Dr T Smit**

Prediction and measurement of residual stresses in composite materials. Aircraft performance estimation and applied aerodynamics.

[teubes.smit@wits.ac.za](mailto:teubes.smit@wits.ac.za)

**Dr A Storm**

Thermodynamic cycle design, focusing on Brayton, Rankine and combined cycles. Alternative energy systems. Combustion systems modelling and design with emphasis on coal combustion.

[andre.storm@wits.ac.za](mailto:andre.storm@wits.ac.za)

**Dr B Smith**

Intersection of machine learning (deep learning, reinforcement learning), explainable machine learning and causal inference (counterfactual explanations). Why do ML models make their predictions? Which features in the model are causes of the outcome? How can we use machine learning to generate causal (counterfactual) models?

[Bevan.smith@wits.ac.za](mailto:Bevan.smith@wits.ac.za)

**Dr A Panday**

Aircraft design, aircraft performance, flight dynamics, aircraft flight control, aircraft certification. Mathematical modelling, simulation and controller design of mechatronic systems for industrial, transport, medical and lifestyle applications. Integration of artificial intelligence in control systems. Ethics of artificial intelligence. Technology management & commercialization. Technology transfer & adoption of technologies in society. Development of science policy

[aarti.panday@wits.ac.za](mailto:aarti.panday@wits.ac.za)

**Ms M Moyo**

Flight Dynamics modelling and simulation, Intelligent Systems and Control, Unmanned Aerial Vehicle technology, Automation and Robotics.

[makhosazana.moyo@wits.ac.za](mailto:makhosazana.moyo@wits.ac.za)

**Prof K Hassani**

Biomechanics, Cardiovascular Engineering, Biomedical Engineering

[kamran.hassani@wits.ac.za](mailto:kamran.hassani@wits.ac.za)

**Prof M Sharifpur**

Heat Transfer, CFD, Multi-Phase Flow, Nanofluids

[mohsen.sharifpur@wits.ac.za](mailto:mohsen.sharifpur@wits.ac.za)

## **Industrial Engineering, Systems Engineering and Engineering Management**

### **Prof E Olugu**

Operations Research, Process Optimization, Soft Computing, Green Supply Chain Management, Reverse Logistics Management, Sustainable Manufacturing, Maintenance & Reliability Engineering, Industrial Ergonomics and Occupational Safety, Tribology

[ezutah.olugu@wits.ac.za](mailto:ezutah.olugu@wits.ac.za)

### **Prof R Siriram**

Firm competitive advantages specifically from a technology, project management and systems thinking perspective. New avenues of research include renewable energy and sustainability and the 4th Industrial revolution. Interesting opportunities exist to explore how firms can gain competitive advantage in a VUCA (Volatile, uncertain, complex, ambiguous) environment.

[raj@alpha-concepts.com](mailto:raj@alpha-concepts.com)

### **Dr G J Oyewole**

Operations Research (OR) and Business analytics, Simulation Modelling of Discrete Event Systems, Facility location and Transportation models, Data meets Decisions (Integrated models of OR prescriptive analytics and machine learning predictive analytics)

[gbeminiyi.oyewole@wits.ac.za](mailto:gbeminiyi.oyewole@wits.ac.za)

### **Dr A Botha**

Strategies, Business Process Improvement (Kaizen, Toyota Way, Theory of Constraints, Simulation), Management of Technology, development of Technology Scenarios, Strategic Planning, development of System Dynamics and Optimisation Models, development of Economic Models for Technology Products, Project Management, Integration of Disparate Business Entities into Synergistic Units

[abotha@alum.mit.edu](mailto:abotha@alum.mit.edu)

### **Ms S Chatur**

Theory of Constraints, Process Analysis (Process flow time reductions), and Production management and scheduling systems (Push and Pull systems).

[sabrina.chatur@wits.ac.za](mailto:sabrina.chatur@wits.ac.za)

**Dr M Dewa**

Design and development of Digital Assistance Systems (DAS), Systems Engineering (SE), Quality Engineering, Systems modelling and simulation, Project Management (PM), Change Management, Design and development of Information Systems, The Industrial Internet of Things and Engineering Education.

[mncedisi.dewa@wits.ac.za](mailto:mncedisi.dewa@wits.ac.za)

**Dr B Emwanu**

Manufacturing strategy (MS) content, process and context in competitive environments. Linkages with business ecosystems, management and leadership, drivers and constraints of competitiveness, business strategy, performance and metrics, technology and innovation, supply chain, industrial policy, internationalisation and globalisation. Application to Services and other sectors. Strategy formulation and implementation complexities. Modelling firms strategically.

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**Dr D Gonsalves**

Addressing large national problems in the area of security; futures and systems approaches, enterprise engineering, systems engineering; complexity and transdisciplinary research.

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**Dr. Mahlatse Rabothata**

Materials engineering, Manufacturing, Optimization, Engineering Education

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**Dr R Muvunzi**

Additive Manufacturing, Industry X.0, Operations Management, Advanced Manufacturing Technologies, Mechanical Design and process optimisation

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**Mr B Sarema**

Renewable Energy Systems-Solar PV, Solar Thermal and Green Hydrogen Technologies, Manufacturing Processes, Operations Research Techniques, World Class Manufacturing Systems, and Physical Asset Management

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