

# DEPARTMENT OF MATERIALS SCIENCE AND METALLURGICAL ENGINEERING

[www.up.ac.za/materials-science-and-metallurgical-engineering](http://www.up.ac.za/materials-science-and-metallurgical-engineering)

## KEY RESEARCH IMPACT

The research of EBIT's Department of Materials Science and Metallurgical Engineering aims to achieve optimised industrial processes, be it in minerals processing, the extraction of valuable metals or in the manufacture and fabrication of advanced alloys and products. Such process innovations are frequently aimed at the realities of South African plants and feedstocks, and result, among others, in the production of high-quality products through the innovative use of existing plant or available minerals. With regard to digital (4IR) manufacturing, research carried out in this Department aims to facilitate laser-based and additive manufacturing technologies.

## RESEARCH OPPORTUNITIES (FOCUS AREAS)

- Minerals processing, with a particular focus on gravity separation and fines recovery
- Pyrometallurgy and pyrometallurgical modelling, with a specific focus on platinum group metals
- Hydrometallurgy and gold recovery
- Refractory materials
- Microalloying and thermomechanical processing, incorporating alloy and process development
- Physical metallurgy and corrosion
- Materials degradation and forensics, including steel and aluminum alloys
- Welding and repair of service-degraded alloys
- Additive manufacturing and laser processing

## RESEARCH PRIDE

### Research chairs and entities

- Anglo-American Chair in Pyrometallurgy
- Centre for Pyrometallurgy
- Industrial Metals and Minerals Research Institute
- SAIW Centre for Welding Engineering


### South African National Research Foundation (NRF)-rated researchers

- Prof Andrie Garbers-Craig (C1 NRF-rating)
- Prof Waldo Stumpf (C2 NRF-rating)
- Prof Dick Groot (C3 NRF-rating)
- Dr Theresa Coetzee (C3 NRF-rating)
- Prof Charles Siyasiya (C3 NRF-rating)

## INDUSTRY CONTRIBUTION

The Department's research programme is focused on industrial and commercial problems facing the world today. It receives generous support from and has many healthy interactions with leading mining and metallurgical companies such as Anglo American Corporation, Kumba Iron Ore, Exxaro, Columbus Stainless, Sasol, ArcelorMittal SA and BHP Billiton.

One of the cornerstones of Industry 4.0 is advanced manufacturing processes and alloys. The South African government has invested significantly in establishing a local titanium industry, given the abundance of this mineral in South Africa. The Department plays an increasingly important role here with research contributions on light metal alloy development, powder metallurgy, investment casting and 3D printing. One example of this is additive manufacturing (3D printing) of Ti-alloys for medical implants and aerospace applications.



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research institution.

Metallurgical engineers unlock the riches of mineral deposits present in the earth's crust. They are assets to the economy of a country and ensure continuous optimisation of minerals processing and metals extraction plants. They also work to enhance industrial plant and component life in demanding process environments.

## CAREER PATHWAYS

Qualified metallurgical engineers can register as professional engineers (Pr. Eng.) after obtaining the required industry exposure. In addition to occupying highly satisfying positions in technology or organisational management, professional metallurgical engineers often undertake consultation projects. Honours and master's degree programmes in the Department allow postgraduate students to obtain specialised knowledge in their chosen field, which will benefit them in their careers in industry. For those interested in an academic or research career, a PhD degree from the Department is an invaluable asset.

## POSTGRADUATE DEGREE PROGRAMMES

### *Honours and master's programmes*

These programmes provide students with in-depth knowledge in selected fields of metallurgical engineering and serve either to enrich the knowledge of the student, or as the fundamental basis of doctoral research.

**BEngHons (Metallurgical Engineering) ■ BScHons (Applied Science) (Metallurgy)**  
**MEng (Metallurgical Engineering) ■ MSc (Applied Science) (Metallurgy)**

### *Welding engineering*

The honours programmes in welding engineering provide students with the knowledge required to register as an International Welding Engineer or as an International Welding Technologist.

**BEngHons (Metallurgical Engineering) option Welding Engineering**  
**BScHons (Applied Science) (Metallurgy) option Welding Technology**

### *Doctoral programmes*

**PhD Metallurgical Engineering ■ PhD Metallurgy**

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