Postgraduate studies: Should I pursue a Masters in Mechanical or Mechatronic Engineering?

Thorsten Becker

Department of Mechanical and Mechatronic Engineering
Stellenbosch University
Overview.

- Why would you want to do a postgraduate degree?
- What type of research does our department do?
- What is a postgraduate study and how does it work at Stellenbosch University?
- How do I go about getting information on a Master topic?
- Funding.
- Supervisor(s).
- Information submitted by various research groups.
- Final remarks.
Why a postgraduate degree?

www.spacex.com
Why a postgraduate degree?

www.engineer4free.com
We do groundbreaking research.
Citations per faculty.

<table>
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<th># RANK</th>
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<th>ACADEMIC REPUTATION</th>
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www.topuniversities.com
Biomedical Engineering

Biomedical engineering (BERG) involves applying the concepts, knowledge and approaches of virtually all engineering disciplines to solve or improve healthcare related problems. Biomedical engineers use their expertise in biology medicine ...

Read more >

Renewable Energy

The Centre for Renewable and Sustainable Energy Studies (CRSES) acts as a central point of entry into Stellenbosch University for the general field of renewable energy. Some contract research projects are completed within CRSES ...

Read more >

Solar Thermal Energy

The Solar Thermal Energy Research Group (STERG) was the first university research group in the country to focus on solar thermal energy research. A main objective of the group is to train students to deliver research outputs in CSP.

Read more >

Thermodynamics and Fluidmechanics

Current project title: Minimized water consumption in CSP plants (MinWaterCSP) Project duration: 36 months, started 01/01/2016
Consortium: 12 partners from 6 countries Demo sites: South Africa, Morocco and Spain Academic Institution partners: Fraunhofer ISE, Stellenbosch University, University of Rome, IRESEN

Read more >

Sound and Vibration

The Sound and Vibration Research Group (SVRG) is situated in the Department of Mechanical and Mechatronic Engineering at the University of Stellenbosch. The SVRG has established expertise, equipment and laboratory facilities ...

Read more >

Mechatronics, Automation and Design

The Mechatronics, Automation and Design (MAD) Research Group focusses on product design and manufacturing systems that combine controllers, sensors, actuators and/or mechanisms, such as reconfigurable manufacturing systems and ...

Read more >

Materials Engineering

The Materials Engineering group is working with many of the leading national and international institutions in the area of materials engineering. The level of contact varies from fully funded research projects, through to partial funding of projects ...

Read more >

Materials, Optimisation and Design (MOD)

The Materials, Optimisation and Design research group work on a diverse group of projects related to structural analysis and optimisation. The primary goal of which is producing or facilitating advanced engineering design

Read more >
What is a postgraduate study?

Masters in Mechanical or Mechatronic Engineering.
• Research Masters (typically a 2 year program, full time):
  • 1 semester of course work at an advanced level.
  • 2-3 semesters of research.
  • Submission of a research thesis.
  • Submit a research article for publication.
• Structured masters (CRSES, typically a 1 year program):
  • 2 semesters of course work at an advanced level.
  • Project.

PhD in Mechanical or Mechatronic Engineering.
• 3 year program (full time).
• 36 months of research.
• Novel and groundbreaking.
• Submission of a research thesis.
• Publication numerous research articles and conference talks
How do I go about deciding on a MEng?

Ask yourself three questions.

1. What type of project will get me up in the morning?
2. Who would you prefer to work with in the department? i.e. who will be your supervisor?
3. Do I require financial assistance / funding?
Funding.

Listen. Let me tell you how it works.

Art and Research have a lot in common...

Searches for truth:

Values originality and creativity:

Makes the world a better place:

Really hard to get funding for:
Some research projects are funded. Some are not.

Sometimes you can be lucky and become part of a well funded research program, sometimes you need to organize your own funding through scholarships and bursaries.
Supervisor(s).

How you see yourself:

Complex Human Being

Hopes

Dreams

Aspirations

How most professors see you:

Brain

So, how's research?

Stick

www.phdcomics.com
You require a supervisor from our department. You can have co-supervisors from any other department or university.

- Someone that is an expert in your intended field of study.
- Someone who understands you and whom you understand.
- Someone who will encourage and assist you to develop standards of achievement that will result in a thesis of merit.
- Someone that does not do the work for you.
- Someone that you can arrange to meet regularly (i.e. has time for you).
- Someone that gives you feedback and critique.
- Someone that can help mediate in certain situations.
https://www.sun.ac.za/english/faculty/eng/mechanical-mechatronic/Pages/postgraduate-research-topics.aspx
• Qualification of 3D printed titanium parts for Medical Implants and Aerospace components.

• Degradation of material properties using computer vision.

• Resource efficient process chains for titanium products: near net-shape preforms using powder metallurgy

• Collaboration with local university (UCT, CUT, CSIR) and international Universities (Oxford, Leuven).

• Contact:
Assoc. Prof Thorsten Becker tbecker@sun.ac.za
Assoc. Prof Debby Blaine dblaine@sun.ac.za
www.sun.ac.za/mateng

Materials Engineering group
Prof Anton Basson
Dr Karel Kruger

Industry 4.0 and Cyber-Physical Systems in the South African context

→ Development of architectures and frameworks for “digital twins” of machines and systems
Industry 4.0 and Cyber-Physical Systems in the South African context

→ Development of architectures and frameworks for “digital twins” of human workers
DIGSAA - Digital twin solutions for the SA Agulhas II
Topics – DIGSAA

Contact: Annie Bekker

Supervisors:
Annie Bekker, Chris Meyer, Jacques Muyzer

Topics:
• Wave slamming
• Rigid body motion
• Scale modelling

Techniques:
Measurement, Signal processing, Modelling, Advanced data analytics, Multivariate models, augmented reality

Bursaries:
Masters R 70k + top up, PhD R100k + top up
Bulk Materials Handling using the Discrete Element Method (DEM)

Prof Corné Coetzee (ccoetzee@sun.ac.za)

- The modelling of granular materials with the focus on bulk materials handling
- Applications in the mining and agricultural sectors: design of new and improving of existing systems and equipment
- Collaboration with local companies and international universities
- Possible funding for Master students

Discrete Element Modelling of Conveyor and Transfer Chute

Discrete Element Modelling of Fertiliser Spreader

Discrete Element Modelling of Soil Tillage
Agricultural Engineering
Postharvest Technologies
Prof Corné Coetzee (ccoetzee@sun.ac.za)

- The optimisation of packaging for fruit and vegetables: existing and new
- Finite element modelling (FEM) to investigate and improve the structural integrity
- Computation fluid dynamics (CFD) to analyse and improve the cooling processes
- Close collaboration with the department of horticultural sciences at Stellenbosch and local manufacturers of packaging materials
- Possible funding for Master and PhD students
Gerhard Venter

• Part of MOD research group
• Linear and non-linear FE analysis
• Numerical design optimization and related technologies
• Application to a wide range of real world problems
• Mostly funded from industry
• Currently: material characterization and load recovery using inverse FE analyses
• Contact: Prof Gerhard Venter
gventer@sun.ac.za
Wind mitigation for ACC fans

Development of novel wind mitigation mechanisms for air-cooled condenser fans. Partial bursary available and possible collaboration with Howden Netherlands.

Virtual sensors

Development of virtual sensors for the prediction of quantities that are impossible or expensive to measure directly by combining traditional physics based modelling and machine learning. Partial bursary available and possible collaboration with NTNU or Howden Netherlands.
Microcirculation Flow Patterns in the Lymphatic System

- Investigations into
  - Initial lymphatics
  - Lymph propulsion
  - Pressure gradient

- Liora Ginsberg
- ginsberg@sun.ac.za
RESEARCH AREAS

• Heat transfer & fluid dynamics
• Industrial heat exchangers
  • Dry, wet & hybrid cooling
• Renewable & sustainable energy
  • Reducing energy related water consumption
  • Solar energy applications
• Energy efficient buildings
  • Thermal performance of buildings

POST-GRAD OPPORTUNITIES

• ACC fan performance
  • Numerical and experimental work
  • Wind screens, inlet configurations, ???
• Hybrid condensers
  • Primarily experimental work
  • Performance characterization
• Other
  • Anything rad, come and talk to me! Bring coffee.

mikeowen@sun.ac.za, M516
Artificial Intelligence, Machine Learning & Machine Consciousness

Will Robots Ever Achieve Genuine Consciousness?
How Will We Know?

Consciousness is the most familiar aspect of life, but it is also the most mysterious. An important question is whether we can recognize genuine consciousness or it occurs outside of ourselves. This has gained more attention over the past few decades due to advances in artificial intelligence (AI) that impact our lives in this little field. A future society is still in its infancy in terms of how to define genuine consciousness. One day, it may apply for citizenship. In any case, is there a way to define genuine consciousness? Thus, the question is what makes a conscious human. People often point out cases of human consciousness to prove that certain actions can be taken as evidence of consciousness. To what extent do these actions prove that we are conscious?

Fictional stories such as Her (2013) and Ex Machina (2015), and TV series like Westworld (2016) and Humans (2015-17), explore these questions. In these stories, androids are not without a soul or a heart, but they seem to become more complex as the story progresses. But in the real world, how could we determine if such advanced robots possess genuine consciousness? Does it make sense to assign a consciousness rating to each robot? Is consciousness a mere “USP consciousness” or an approach similar to graded states of consciousness observed in various stages of normal sleep or Alzheimer’s disease?

These kinds of basic questions have been both debated for many years. During the Second World War, the mathematician Alan Turing, who is often described as the father of modern computer science, proposed a now-famous test to identify human-level intelligence. The Turing test employs two separated rooms, one occupied by a human and the other by a computer. The observer sends questions to both rooms. If an expert cannot tell which room holds the computer, Turing proposed that the computer should be regarded as having human-level intelligence. While some have interpreted...
Contact:

• Pieter Fourie (prfourie@sun.ac.za)
• Cobus Muller (cobusmul@sun.ac.za)
• Johan van der Merwe (jovdmerwe@sun.ac.za)
• Martin Nieuwoudt (martin.Nieuwoudt@gmail.com)
• Dawie van den Heever (dawie@sun.ac.za)

www.the-berg-us.com
Thermofluids Division: Research on Octane Blending Behaviour

- Octane blending behaviour research done in collaboration with Sasol Energy
- Current project: Synergistic and antagonistic (+ve and –ve non-linear) octane blending behaviours of common hydrocarbon molecular classes and octane boosting additives
- Uniquely modified octane engine in Department used for testing fuel blends. Engine is one-of-a-kind in South Africa
- Funding for the next project on octane blending behaviour and modelling is available and includes a student bursary
- Students who are interested in this project or this field of research can contact Mr Richard Haines (rhaines@sun.ac.za) for more information
We need:

- Better UAV controllers
- Drones that will wash heliostats
- Obstacle detection system for UAVs
Measurements with cameras

- Capture the motion of a mountain biker with drones
- *Prof. Schreve, Dr Muller, Dr Smit*
Final remarks.