Reference Guide to

Research & Development in the Department of

Mechanical Engineering

University of Cape Town
## Contents and Research Entities

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This is a challenging time for all of us. We have experienced an unprecedented lockdown and we have had to engage in emergency remote teaching and learning to keep the academic project going. The temptation may be to only focus inwards, on the here and now. However, I want to encourage you to rather look outwards, toward your future. You have amazing career prospects once you complete your bachelor’s degree. Many fantastic opportunities will come your way, but how can you ensure that you stand out from all the other excellent job applicants? One way to stand out is to obtain a postgraduate degree.

Besides the obvious benefits of gaining specialist technical knowledge and skills, postgraduate study also offers the opportunity for immense personal development. Completing a postgraduate degree will require you to develop a whole range of transferable skills in areas of problem solving, project management, communication, critical thinking, data analysis, organisation and time management. That is why we find so many engineers with postgraduate qualifications working as successful financial analysts, investment managers and CEOs of companies (and, of course, in engineering!).

As the Department of Mechanical Engineering at UCT we have compiled this Research Reference Guide to offer you the opportunity to look into postgraduate study.

I invite you to see for yourself the wide range of postgraduate research activities available. I have no doubt that this will really benefit your future!

Kind regards
Prof. Brandon Collier-Reed
On completion of a bachelor’s degree everyone is eager to embark on a rewarding career with a good and stable income. An undergraduate degree will certainly give you a head start. However, it is really only the starting point of a lifelong learning curve. Postgraduate study is one way of accelerating this learning process early on in your career.

While doing a postgraduate degree you will gain technical knowledge and learn skills that will be difficult to acquire while working in industry. You will have the opportunity to pursue a specialist area of interest via an individual research project under expert guidance, and may also include selected advanced courses. Besides the obvious intellectual reward, it will enhance your personal growth in terms of observation, analysis, interpretation, reflection, evaluation, decision making, explanation, written communication and time management.

You may be worried that if you delay entry into the job market, you could fall behind your classmates in income and experience. Having a postgraduate degree certainly does not guarantee you a bigger salary in your first year of employment. However, building on a stronger foundation will enable you to gain more benefit from each day of on-the-job experience and push out the boundaries to where you can grow. This will set you on an accelerated growth path and, with everything else being equal, the rate at which your income grows will be steeper. This means that over a lifetime of work your job satisfaction and earnings will outstrip that of many others.

We all know that investing in the future is a good thing. Like money, our time is a valuable and limited resource that we need to manage carefully. Investing in postgraduate studies now will pay handsome dividends in the future.

Prof. Pieter Rousseau
Postgraduate Funding

NRF POSTGRADUATE SCHOLARSHIP FOR FULL-TIME STUDIES IN 2021

The NRF minimum academic requirement for postgraduate funding is 65%. Applicants for honours, masters and doctoral funding must be 28, 30 and 32 years of age or younger respectively in the year of application. Successful applicants will be funded either at Full Cost Study (FCS) or Partial Cost of Study (PCS). The FCS funding will be awarded to South African citizens and permanent residents only, who are either financially needy (i.e. those whose combined household family income is less or equal to R350 000 per annum), living with a disability or exceptional academic achievers. However, the PCS funding will be awarded to 5% of international students including South African citizens and permanent residents who could not be funded under FCS but meet other minimum requirements for the NRF scholarship funding criteria.

ELIGIBILITY CRITERIA

Honours: Only South African citizens and permanent residents are eligible for honours bursaries.
Masters and Doctoral: are open to South African citizens, permanent residents as well as a limited percentage of foreign nationals who will be registering at South African public universities in 2021 on a full-time basis only.

Scholarships are intended to support honours, masters and doctoral candidates to pursue studies in all areas of Science, Engineering, Technology, Social Sciences, and Humanities

Maximum period of support – Honours: 1 year, Masters: 2 years, Doctoral: 3 years, Extension funding: Six or Twelve months.

UCT INTERNAL DEADLINES:
Masters and Doctoral First-Time Applications: 30 June 2020
Extension Support for Master and Doctoral Applications: 30 June 2020
Nuffic Split-Site Doctoral Applications: 30 June 2020
Honours level First-Time Applications: 31 October 2020

IMPORTANT NOTE:
To be eligible for UCT merit and need awards, you are required to apply for these NRF scholarships via form 10A. UCT will reject applications submitted after the UCT internal closing dates as indicated above.

Ms Bongiwe Ndimane – PG Funding Office

How to apply: https://nrfsubmission.nrf.ac.za
Questions? Email : NRFFunding@uct.ac.za
Career Possibilities and Support

ALL ABOUT EMPLOYABILITY

Employability is about being capable of getting and keeping fulfilling work, and the capability to move self sufficiently within the labour market to realise potential through sustainable employment.

Employability is not only about your qualification. It also involves these elements:
- Degree subject knowledge, understanding and skills
- Generic skills
- Emotional Intelligence
- Career development learning
- Experience: Life and work
- Reflection and evaluation
- Self confidence and self esteem

THE BENEFITS OF POSTGRADUATE STUDY

- Higher earning potential
- Gives you the edge and helps you to stand out
- You gain skills that you are not exposed to at undergraduate level
- Can start you off as a specialist but also enable cross disciplinary options
- Starting point for an academic career

WHAT WORK CAN YOU DO WITH THIS DEGREE?

- Graduates work in many different contexts in subject related work but also use their transferable skills and work in consulting, finance, data science and various entrepreneurial pursuits to name a few
- On LinkedIn, search MSc Mechanical Engineering and choose people. This will show you profiles of people with this degree and the variety of work they do

HOW THE CAREERS SERVICE CAN HELP

- Our resources help with applications, CVs, LinkedIn pages and interview preparation
- Visit our Vula page for all resources (left side bar on the Vula landing page) or visit www.careers.uct.ac.za/students
- Book a consultation with a careers advisor by going to “Ask a question” on mycareer.uct.ac.za. We consult virtually on the platform of your choice.
- We host job expos, company webinars and presentations
- We also host Career Conversations webinars where graduates talk about their career journeys
- Find advertised job opportunities on mycareer.uct.ac.za

www.uct.ac.za
mycareer.uct.ac.za
careers.service@uct.ac.za

Mrs Ingrid van der Merwe – Head : Careers Advisory
POSTGRADUATE STUDIES IN EBE

EBE Postgraduate studies involve research into a specific field. This is more specialised and in depth than undergraduate studies, which are broader and more foundational. The various types of postgraduate degrees in EBE include Honours, Master of Science (MSc), Master of Philosophy (MPhil) and Doctor of Philosophy (PhD). Some of these degrees have course work components and research components while others are purely research based.

THE BENEFITS OF STUDYING POSTGRAD

Undertaking postgraduate studies gives one an opportunity to further develop and refine one’s knowledge in a field of interest. Postgraduate studies are not as structured as undergraduate studies enabling one to have more freedom in steering the learning process. It can also open doors to exclusive, highly skilled and intellectually stimulating job opportunities thus increasing one’s career prospects.

SKILLS AND TOOLS GAINED AS A POSTGRAD

- Research and/or laboratory skills
- Independent learning
- Time management
- Critical thinking, analysis and problem solving skills
- Ability to tackle complex concepts, unpredictable issues and to make informed decisions based on incomplete information
- Independent management of a project
- Communicating ideas effectively in different ways

POTENTIAL PITFALLS AND HOW TO AVOID THEM

It’s easy to get distracted or overwhelmed by the literature. It’s very common to feel like one has reached a dead end or that one is not steering oneself in the right direction. This is natural and does happen when trying to learn something new. It can however be avoided or at least minimised by regularly checking in with one’s supervisor and talking to other researchers; within or outside of one’s field. It is also important to cultivate self-discipline and to learn to manage one’s time effectively.

Mokgadi Setshekgamollo – EBE Postgraduate Student Council Academic Chair

MSc (Eng) Electrical Engineering Specialisation
WHO WE ARE & WHAT WE DO
The Advanced Manufacturing Laboratory (AML) is committed to enhancing the competitiveness of South African industry through the development of high value manufacturing technology as well as through growing people talent. The main research focus is on high performance machining, polishing technologies, manufacturing process optimization, intelligent manufacturing systems and laser processing technologies. Since its inception, the AML has developed expertise that has assisted South African precision engineering, aerospace, tooling and automotive companies to improve their manufacturing processes.

Growing R&D manpower for South African industry is achieved through the development of high calibre graduates and postgraduates and offering training to various industrial partners. The AML is committed to creating intellectual capital and contributing to industrial know how through critical research and development in the materials machining and manufacturing arena.

CURRENT RESEARCH FOCUS
- High performance machining
- Polishing technologies
- Manufacturing process optimization
- Intelligent manufacturing system 4.0
- Hybrid manufacturing technologies
- Failure analysis on manufacturing tools and processes

RECENT RESEARCH PUBLICATIONS
- Ramesh Kuppuswamy, Nomvelo Mkhize, (2017) Near Ductile Regime Machining of Tungsten Carbide insert through Control of Cutting Speed Parameter While Using a Poly-Crystalline Diamond Tool, Procedia Manufacturing, 8(549-556)

CONTACT DETAILS
A/Prof. Ramesh Kuppuswamy B.Eng. (Hons), M.Tech, PhD (Singapore)
Email: Ramesh.kuppuswamy@uct.ac.za Phone:+ 27 21 650 4872
ATProM Research Unit

WHO WE ARE
Prof Pieter Rousseau, A/Prof Wim Fuls, Dr Ryno Laubscher,
Priyesh Gosai, Colin du Sart.

WHAT WE DO
Rising energy demand and the imminent threat of climate change are critical issues in society today. Thermofluid systems provide the backbone of almost all energy conversion processes for renewable and conventional power generation, as well as heating and cooling systems such as heat pumps and refrigeration cycles.

The Applied Thermofluid Process Modelling Research Unit (ATProM) specialise in modelling these systems to evaluate novel technologies, improve the efficiency and control of processes, and detect anomalies for condition monitoring purposes.

Fundamental models are built using detail computational fluid dynamics and integrated one-dimensional thermofluid networks. These are often combined with advanced optimization techniques and data-driven models such as multi-layer perceptron, convolutional, recursive- and variational auto encoder neural networks, that are derived via machine learning techniques.

This unique combination of fundamental thermofluid principles and artificial intelligence techniques enable the development of accurate and computationally inexpensive numerical tools to address industry needs.

CURRENT RESEARCH FOCUS
• Supercritical CO\textsubscript{2} (sCO\textsubscript{2}) Concentrated Solar Power (CSP) plants.
• Optimization of heat pump systems.
• Flexibility of fossil fired plants (coal, gas turbines and combined cycles).
• Energy storage systems.
• Biomass energy conversion.
• Development of energy system forecasting models.

SPECIALISED FACILITIES
• Specialized CFD and thermofluid process modelling software.
• Access to high performance computing centre.
• Access to measurement facilities at real power plants.

RECENT PUBLICATIONS
• Akpan PU & Fuls WF, 2019, Application and limits of a constant effectiveness model for predicting the pressure of steam condensers at off-design loads and cooling fluid temperatures, Applied Thermal Engineering, Vol 158, 113779.

CONTACT DETAILS
WEBSITE: www.atprom.uct.ac.za EMAIL: atprom@uct.ac.za
Bioengineering

WHO WE ARE & WHAT WE DO
Medical expertise combined with mechanical engineering skills has created our research and application work in Bioengineering. The human skeleton and soft tissue provide the foundation to our designing and developing a large number of implants for patients suffering from bone cancer or bone tumours. Our research focus is on implants for limb-salvage surgery and recently on implants that require complex surface development using multiple software design packages. These complex implants are used in replacement surgery for the scapula, the pelvis, the trapezium and the talus or any other bone with a complicated surface structure. The implants are designed for anatomical reconstruction of the skeleton, which in most cases, offers not only a better solution for the smooth transmission of forces, but also helps the patient from an aesthetic perspective. Modular implant systems designed by this group for both upper and lower limbs have been used in surgical operations at hospitals in South Africa and India.

Research currently focuses on improving the manufacturing processes for the implants and identifying new technologies, new choices of materials, treatment of articulating surfaces, as well as osseo-integration between skeletal tissue and implant. This has brought collaboration in research and development with academic institutions in South Africa and in India.

CURRENT RESEARCH FOCUS
- Bioengineering implant design and software integration
- Maxillo-facial reconstruction
- Development of implants for use in bone tumoursurgery
- Implant materials research
- Osseo-integration between natural bone and implant materials using stem cell technology
- Bio-compatible materials selection for bone implants

KEY RESEARCH COLLABORATORS
- Central University of Technology
- Centre for Materials Engineering (UCT)
- Tata Memorial Hospital Mumbai (India)
- University of Stellenbosch
- Department of Architecture (UCT)
- Department of Surgery (UCT Medical School)
- Department of Human Biology (UCT Medical School)
- International Implant Manufacturers and Suppliers

SPONSORS
- Medical Research Council of South Africa

AWARDS
- Inventor of the Year - Popular Mechanics - 2011 (Dr George Vicatos)
- Cutting Edge Technology Award - Popular Mechanics - 2011 (Dr George Vicatos)
- Best patent of the year - 2003 (Dr George Vicatos)

SPECIALISED FACILITIES
- Laser titanium alloy component formation laboratory (CUT)
- Rapid prototyping equipment – Department of Architecture (UCT)

CONTACT DETAILS
George.vicatos@uct.ac.za
WHO WE ARE & WHAT WE DO

The Blast Impact and Survivability Research Centre (BISRU) focuses on the fundamental understanding of blast and structural impact scenarios. BISRU currently operates a unique suite of blast impact assessment equipment located at its own test facility. Our research focus seeks to save lives and reduce the risk of injuries that may arise from extreme loading events in addition to understanding the mechanics and dynamics of blast and impact loads. Our research activities are aimed at promoting the investigation and understanding of impact dynamics through both analytical, numerical simulation and laboratory based studies. BISRU is involved in several multi year programmes to study the loading and damage caused by explosions and to develop blast resistant lightweight materials or structures. Research in our facility also seeks to understand the properties of homogeneous materials as well as biological, cellular and multi layered materials under blast and impact conditions.

CURRENT RESEARCH FOCUS

- Blast characterisation
- Material characterisation at very high strain rates
- Structural response to blast loading
- Buried charges (landmines)
- Energy absorbers in crashworthiness and blast application
- Prediction and measurement of human body response to blast and impact events
- Characteristics of bio-materials

KEY RESEARCH COLLABORATORS

- Institute of Mechanics Bulgarian Academy of Sciences (Bulgaria)
- Beijing Institute of Technology (China)
- Saint Cyr Military Academy (France)
- University of Sheffield (UK)
- University of Southampton (UK)

SPECIALISED FACILITIES

- Computational software and high capacity servers for finite element analysis
- Blast chamber
- Ballistic pendulum
- Drop testers
- DIC systems
- Composite manufacturing equipment
- Gas gun for ballistic penetration studies
- Hopkinson Bar apparatus (variable configurations including tension & compression)

SAMPLE PUBLICATIONS

- The behavior of cancellous bone from quasi-static to dynamic strain rates with emphasis on the intermediate regime, M. Prot, T. J. Cloete, D. Saletti, S. Laporte, Journal of Biomechanics, Vol 49(73), May 2016.

CONTACT DETAILS

Website: www.bisru.uct.ac.za
Email: steeve.chungkimyuen@uct.ac.za
WHAT WE DO
The Centre for Materials Engineering engages in research that addresses real industry problems, and at the same time increases the knowledge base about materials. We investigate the properties and behaviour of a wide range of materials, principally metal alloys but also polymers, ceramics and composites. Our extensive modern laboratory facilities enable advanced characterisation and mechanical property measurement, including fatigue and fracture assessment, of a broad range of engineering materials and we are able to support local industrial development by providing assistance with selection of materials and optimisation of properties to suit process and service requirements.

The strong academic and technical expertise in the Centre underpins a thriving postgraduate activity that promotes human resource development for local industry and also fosters the growth of future researchers.

Our particular focus on the deformation processing of metal alloys assists in improving the competitiveness of local metal producing industries and prepares graduates for employment in this important South African manufacturing sector.

CURRENT RESEARCH FOCUS
• High temperature and high stress performance of materials in power plants.
• Production of titanium alloy commodity products from powder metal.
• Fatigue fracture and residual stress assessment of Laser Additive Manufactured titanium and nickel based super alloy components.
• Aluminium beverage can stock process development
• Visualisation of material properties by high resolution electron microscopy.
• Biodegradable polymers and foams derived from vegetable oils.

MOST RECENT PUBLICATION

KEY RESEARCH COLLABORATORS
ESKOM
Hulamin
CSIR
Stellenbosch University
Central University of Technology
University of Glasgow
Nelson Mandela University

To see a list of current postgraduate projects visit http://www.mateng.uct.ac.za/mateng/people/postgraduate-students
contact person: Robert.knutsen@uct.ac.za
WHO WE ARE & WHAT WE DO

The principal objective of the Centre for Research in Computational and Applied Mechanics (CERECAM) is to provide a coherent focus and point of interaction for research in the area of non-linear mechanics, by promoting and supporting fundamental research and applied research. A major area of interest is in computational mechanics i.e. the computational simulation of flow, deformation and failure in natural processes, engineering components or artefacts. Other research interests focus on theoretical studies in solid and fluid mechanics, partial differential equations, computational algorithms and experimental studies. CERECAM has as a key objective to be the centre of expertise in SA in its area of research, to provide a link between industry and academia, and to provide postgraduate training in such a form that its graduates make a real contribution to SA industry.

CURRENT RESEARCH FOCUS

• Computational solid, structural and particulate mechanics
• Numerical analysis and partial differential equations
• Biomechanics
• Computational fluid dynamics
• Particulate flow characterisation in industrial and biological systems
• Computational electromagnetics

RESEARCH COLLABORATORS

• Centre for Minerals Research (UCT)
• Crystallisation and Precipitation Research Unit (UCT)
• Blast Impact and Survivability Research Unit BISRU (UCT)
• Centre for Materials Engineering (UCT)
• Cardiovascular Research Unit (UCT Medical School)
• Departments of Surgery and Human Biology (UCT Medical School)
• SASOL Advanced Fuels Laboratory
• Universities of Dortmund / Darmstadt / Munich / Erlangen-Numberg / Hanover (Germany)
• Carnegie-Mellon University and Washington State University (USA)
• Karlsruhe Institute of Technology (Germany)
• University of Nottingham (UK)
• University of Queensland and Australian National University (Australia)
• Universities of Montana / Northwestern University / Tulane University (USA)
• Obafemi Awolowo University (Nigeria)
• University of South Africa / University of Pretoria / University of Stellenbosch
• Indian Institute of Technology Madras (India)

RECENT PUBLICATIONS


CONTACT DETAILS

Website: www.cerecam.uct.ac.za
Email: cerecam@uct.ac.za
WHO WE ARE

A/Prof. Chris von Klemperer (Liquid resin moulding methods, Mouldless manufacture, 3D Printing of Fibre reinforced Polymers)

Dr Reuben Govender (BISRU, Delamination, Fracture, Multiaxial loading, 3D printing methodologies and materials)

Mr Sa-aadat Parker (Numerical Optimisation, Optimum Stacking Sequence Design, Composite Material Characterisation)

WHAT WE DO

The Composites Laboratory initiates research on all aspects of the manufacture and processing of composite materials. Specialised test specimens for use in non-destructive testing research and blast impact evaluation are created and the resulting damage and test results are analysed.

Research within the laboratory also focuses on optimising composite materials processing, including using vacuum infusion manufacture to make composite components with a particular focus on low cost and Mouldless Manufacture of FRP composite structures.

A further aspect of the research concentrates on numerical optimisation of composites with particular focus on lay-up. The characterisation of various composite materials is undertaken in conjunction with the Centre for Materials Engineering.

3D Printing research focuses on the manufacture of 3D printed polymeric structures and designs as well as the development of 3D Printers and materials.

CURRENT RESEARCH FOCUS

• Blast response of composite materials and structures.
• Mouldless manufacture and low cost FRP manufacturing
• Numerical optimisation of composite laminate structures
• Continuous Fibre Reinforced Polymer 3-D Printing
• Embedded 3D Printing with liquid and gel inks and resins

PUBLICATIONS


KEY RESEARCH COLLABORATORS

• Durban University of Technology (Reinforced Plastics Technology Station)
• Centre for Materials Engineering - University of Cape Town
• Blast Impact Survivability Research Unit – University of Cape Town
• University of Stellenbosch (Mechanics Division)

SPECIALISED FACILITIES

• Dedicated composites processing facility with oven and vacuum bag facilities
• CNC Router
• 20 ton press
• FDM 3D Printers.

CONTACT DETAILS

Chris.vonKlemperer@uct.ac.za
Reuben.Govender@uct.ac.za
Sa-aadat.parker@uct.ac.za
WHAT WE DO
Engineering Education research focuses on gaining an understanding on how to increase the number of engineers that successfully graduate from the undergraduate and postgraduate programs offered in the Department of Mechanical Engineering.

A group of staff within the Department, who hold engineering education as their research focus, now participate in a number of projects aimed at improving the educational offering in the Department of Mechanical Engineering as a whole. This includes research into teaching and learning practice, tutoring and mentoring systems, curriculum design and the social structure of higher education in the South African context. This work is undertaken in collaboration with other departments in the Faculty of Engineering and the Built Environment, the Centre for Research in Engineering Education and the Centre for Higher Education Development. Ultimately, the intention is to improve the graduation rate of high-quality engineers from the Department of Mechanical Engineering at the University of Cape Town.

CURRENT RESEARCH FOCUS
• Understanding keys to technological literacy in adolescents
• Determining career aspirations among students of different population groups
• Research into why students leave university in good academic standing (non-completion of engineering degree studies)
• Studying the progression of engineering students through departmental programmes
• Podcasting in engineering education
• Identity formation in engineering education
• Workplace learning
• Social responsibility in engineering education

KEY RESEARCH COLLABORATORS
• Centre for Higher Education Development (University of Cape Town)
• Centre for Research in Engineering Education (University of Cape Town)

SAMPLE PUBLICATIONS

CONTACT DETAILS
Website: www.cree.uct.ac.za
Email: bruce.kloot@uct.ac.za
Engineering Management

Dr Corinne Shaw Emeritus A/Professor Tom Ryan

WHAT WE DO
Engineering Management is an active unit of applied and scholarly research in management, focussed primarily on the manufacturing, engineering projects, petrochemical and consulting sectors. The group undertakes research projects designed to develop and grow management expertise and competence primarily in the South African engineering context. The research group has close links with the South African private sector and quasi-government engineering organisations. Our research work places special emphasis on the application of management theory and systems thinking and practice as approaches to problem solving in the workplace. Research draws on systems dynamics modelling and systems methodologies (among others) with the view to contributing to improvements in efficiency and effectiveness of organisations. The working organisation is the laboratory for the research projects undertaken by our postgraduate students.

CURRENT RESEARCH FOCUS
• Learning systemic management practice
• Cybernetics and organisational viability
• Applications of systems thinking in a project environment
• Operations management in manufacturing
• Understanding socio-technical systems, complex systems and systems dynamics models
• Engineering management in 4IR
• Management education and workplace learning

KEY RESEARCH COLLABORATORS
• Kalpana Ramesh Kanjee (CHED), Dr Nien-Tsu Tuan (Construction Economics and Management, UCT), Graduate School of Business (GSB), Centre for Research in Engineering Education (CREE).
• Organisations, companies and consulting practices are the laboratory for our research projects. Postgraduate students undertaking Masters and Doctoral programs, carry out research projects within government and commercial organisations. Typical collaborators in this management research work include consulting engineers, petrochemical plants and power utilities.

SAMPLE PUBLICATIONS
• Amer H and Shaw C (2014). Lean leadership paradoxes: A systematic literature review. 5th International conference on Engineering, Project and Production Management conference proceedings.
WHO WE ARE & WHAT WE DO
The Industrial Computational Fluid Dynamics (InCFD) research group develops state-of-the-art modelling and simulation tools for the express support of industry. This is done via the uncompromising pursuit of innovation through fundamental research which carries the hallmark of excellence. InCFD is home to the South African Research Chair (SARChI) in Industrial CFD.

CURRENT RESEARCH FOCUS
• Volume-Of-Fluid (VOF) based two-phase flow solvers for industry, including compressible, incompressible and weakly compressible formulations.
• Transonic flow aerodynamics and fluid-structure interaction (FSI)
• Reduced order models for aircraft
• Structural damping in sloshing flows
• Higher order numerical methods with shifting interfaces
• Full spacecraft models: Rigid-body and fluid coupling

KEY RESEARCH COLLABORATORS
Prof. Jan Nordström, Linköping University
Airbus (UK)
Sloshing Wing Dynamics (SLOWD) (https://slowd-project.eu/)

SAMPLE PUBLICATIONS

CONTACT DETAILS
Website: www.incfd.uct.ac.za
E-mail: arnaud.malan@uct.ac.za
Non-Destructive Evaluation

WHO WE ARE & WHAT WE DO
The research and development taking place at this laboratory aims to augment the capability of industry to inspect structures non-destructively and also to enhance its capability to establish the structural integrity of components through sensor monitoring techniques.

Our primary aim is to research and perfect techniques that will allow the detection of sub-surface defects in manufactured components and manufactured structures. The objective of the research is to develop non-contacting whole field inspection techniques. At the same time we are working to advance fundamental knowledge in the field of non-destructive testing of materials and manufactured items. Our research into non-contacting inspection is targeted at components manufactured from composite materials such as carbon fibre, glass fibre, reinforced plastics but also includes ferrous and non-ferrous metals.

Research is also focusing on the use of embedded sensors to enable engineers to acquire a better understanding of the response of composite sandwich laminates and materials to the influence of external forces including low-energy impact, vibration and thermal loading.

CURRENT RESEARCH FOCUS
• Non-contacting whole field inspection techniques to detect defects
• Non-destructive evaluation of composite material components
• Optical interference techniques including digital shearography, electron speckle pattern interferometry and conventional holography
• Developing portable NDT systems based on optical interference principles.
• The use of pulsed thermography in parallel with shearographic inspection
• Acoustic emission NDT techniques on the behaviour of composites under stress

KEY RESEARCH COLLABORATORS
• Cape Peninsula University of Technology
• University of Stellenbosch
• Council for Scientific and Industrial Research
• University of Bath (UK)
• Armscor Aero Systems Division

SPECIALISED FACILITIES
• Portable Shearography NDT/E System
• Portable Electronic Speckle Interferometric NDT/E System
• Digital Shearography System

PUBLICATION

SPONSORS
• Armscor Aero Systems Division
• Airbus

CONTACT DETAILS
Mr Dirk Findeis
Dirk.findeis@uct.ac.za
**WHO WE ARE**

Dr Bruce Kloot  
Ms Charmaine Findeis

**WHAT WE DO**

There are more than 20 courses within the Department of Mechanical Engineering that require tutors from Design to Drawing, to Thermofluids and Dynamics, to Project Management and more. Not only is tutoring a good way to earn some money, but other benefits include:

- 5-month contracts
- Regular monthly payments
- Remuneration for meetings with lecturers
- Personal skills training
- Opportunity to help others

There is also a tutoring training workshop to help those who are new to the craft.

**TYPICAL TUTORING PACKAGE:**

<table>
<thead>
<tr>
<th>Tutor (MSc Level)</th>
<th>Time (hrs/week)</th>
<th>Tot. for semester</th>
<th>Rate (2020)</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tutoring load</td>
<td>2</td>
<td>22 hrs</td>
<td>R139/hr</td>
<td>R3,058</td>
</tr>
<tr>
<td>Preparation</td>
<td>2</td>
<td>22 hrs</td>
<td>R139/hr</td>
<td>R3,058</td>
</tr>
<tr>
<td>Admin, meetings etc.</td>
<td>0.5</td>
<td>5.5 hrs</td>
<td>R122/hr</td>
<td>R671</td>
</tr>
<tr>
<td>Marking</td>
<td>1</td>
<td>11 hrs</td>
<td>R122/hr</td>
<td>R1,342</td>
</tr>
<tr>
<td><strong>Total:</strong></td>
<td><strong>5.5</strong></td>
<td><strong>60.5 hrs</strong></td>
<td><strong>R8,129</strong></td>
<td></td>
</tr>
</tbody>
</table>

Monthly payment for 5 months: R1,625.80

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**WEBSITE:** mec-MechanicalEngineering@uct.ac.za
2020 Research Handbook:

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National Research Foundation (NRF) deadline for first-time Masters applicants: 30 June 2020

National Research Foundation (NRF) deadline for first-time Honours applicants: 31 October 2020

Postgraduate Administrator:
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