

Sasol Postgraduate Bursary Scheme

Study field supplementary information

If you have what it takes to become part of this exciting team, the Sasol Bursary Scheme is ready to change your life! Sasol Postgraduate Bursaries are awarded for full-time University study in Science and Engineering, at Masters or Ph.D Degree level. (Students interested in Honours Degree and 4th year studies should apply on the Undergraduate webpage). Please note that Commerce postgraduate bursaries are not supported at this stage.

If you want to apply for a postgraduate bursary, please read through the recommended research fields contained in this document prior to submitting an application.

How to use this document

This document should be used to guide you when filling out your application so that you know what option to select from the “study field” drop-down menu on the online application form. It should also assist you in writing a research proposal. This document contains an explanation of the types of research that Sasol is interested in sponsoring for various Science and Engineering disciplines. It is advisable to read through the entire document as many research fields are multidisciplinary and may be attractive to either Science or Engineering students.

Project-related Enquiries

Students and their prospective supervisors are encouraged to contact the Sasol personnel listed in this document to discuss their interests and gain further insights into the type of research, future direction and opportunities within such technologies. Students should formulate a research project proposal and include a summary of their proposed project on their application. Projects which incorporate a multidisciplinary approach are encouraged. Study at all South African institutions will be considered, taking into account the expertise base of a given department in that area of research.

Submitting your application

Once you have read through this document, submit an application online at the Sasol Careers webpage. Closing date is **5 March 2010**.

Go to www.sasolbursaries.com and follow the link to:

“post graduate bursaries”

Incomplete applications, late applications, email applications and applications submitted by any manner other than the official Sasol website will not be considered. Applicants should be residents of South Africa.

Summary of Sasol postgraduate bursary policy

Post graduate bursaries can be awarded to students doing research in areas which are in broad terms of relevance to Sasol, but are not of prime importance to the company, for Masters and PhD studies.

This Bursary consists of a payment of at least R6240.00 per month payable for the duration of the research project. (Project duration is a maximum of 24 months for a Masters degree, 24 months for a PhD upgrade (from Masters) and 36 months for a full PhD.) This amount is subject to annual adjustments at Sasol's discretion

The recipients are expected to pay their own academic and accommodation fees.

A service agreement will be completed between the bursar and Sasol according to which the student will work for Sasol upon completion of their studies for a period equal to that for which they received the Post Graduate Bursary. Special conditions apply for students with an existing Sasol service agreement.

The bursar and the University will sign a secrecy agreement.

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Analytical Chemistry and Technology

- ICP-MS analysis in organic phases
- Laser ablation ICP-MS (including pressed powders or organic solids)
- Trace Sulphur analysis in solids
- Trace Silicon spectrometric analysis
- GC-ICP-MS
- Trace XRF analysis of lighter elements

Contact person for the above topics:

Johann Fischer, Tel: (016) 960-3623, Email:johann.fischer@sasol.com

- Analysis of dienes in organic matrices

Contact person for the above topic:

Hein Potgieter, Tel: (016) 960-2478, Email:johann.potgieter@sasol.com

- Pre-concentration and analysis of dienes in organic matrices
- Pre-concentration and analysis of oxygenates in organic matrices

Contact person for the above topics:

Carol du Sautoy, Tel: (016) 960-4223, Email:carol.dusautoy@sasol.com

- Dynamics of water condensate equilibrium
 - e.g. as in water knock-out pots
- Mixed phase sampling
 - Hydrocarbon gases, Hydrocarbon condensable components and water
- IR spectroscopy (far, mid & near) and FT stream composition
 - Chemometrics
- Raman spectroscopy
 - Stream composition
 - Chemometrics

Contact person for Analytical Chemistry:

Piet de Coning, Tel: (016) 960-4718, Email:piet.deconing@sasol.com

Environmental Science & Technology (for Science and Engineering)

- Beneficial utilisation of unutilised products
 - Inorganic
 - Organic
- Hydrodynamic and geochemical modelling of inorganic waste materials and wastewaters
- Desalination of industrial wastewaters
- Renewable energy
- Biological treatment of industrial wastewaters
 - Aerobic
 - Anaerobic
- Atmospheric chemistry and modelling

Environmental Technology contact person:

Karl-Heinz Riedel, Tel: (016) 960-2306, Email: Karl-Heinz.Riedel@sasol.com

Geology

- Petroleum Geology
- Geophysics

Contact person for Geology:

Steve Nemcsok, Tel: (011) 344 0802, Email: Steve.Nemcsok@sasol.com

Material Science

- Structure and Symmetry in Crystalline and Non-Crystalline Solids using Diffraction Techniques
 - X-rays, Electron Beams and / or Neutrons
- Study of Metals and Metal Oxides using Synchrotron Techniques
 - EXAFS, XANES, high-resolution XRD & Anomalous X-ray Diffraction
- Advanced Electron Microscopy of Metals and Metal Oxides
- Surface Science

- XPS and Auger Spectroscopy
- Vibrational Spectroscopy of Solids
 - Infrared and Raman
- Magnetic Properties of Metals and Metal Oxides and Mössbauer Spectroscopy
- Physisorption and Chemisorption Techniques
- Calorimetric and Gravimetric Techniques
- Computational Chemistry (Periodic DFT) in Surface Catalysis
 - including Microkinetic and/or Dynamic Monte Carlo simulations
- Coal Mineralogy and Characterization
 - using X-ray Diffraction (XRD) and Scanning Electron Microscopy (SEM-SCAN)

Contact person for Material Science:

Bruce Anderson, Tel: (016) 960-4629, Email: Bruce.Anderson@sasol.com

Statistics

- Global Estimation Criteria for Black-Box functions constructed from Computer Experiments
- Statistical techniques for estimating parameters of Kinetic Models
- Sequential Experimental Design Strategies for estimating Second-Order Response Surface Models
- Modeling Approaches for Refinery Planning and Optimisation
- Evaluating the effect of Variance Reduction Techniques (i.e. Common Random Numbers) on the Design and Analysis of Simulation Experiments

Contact person for Statistics:

Roelof Coetzer, Tel: (016) 960-4355, Email: Roelof.coetzer@sasol.com

Chemical and Refining Technology

- Olefin transformations
 - including metathesis, oligomerisation, dimerisation
- Selective oxidation of paraffins or olefins
- Acid-base chemistry

- including esterification, etherification, condensation chemistry
- Homogeneous C1 chemistry
 - including carbonylation, hydroformylation, selective syngas, methane and CO₂ conversions
- Organic synthesis
 - particularly with relevance to ligand synthesis, phosphorus and nitrogen chemistry
- Kinetic studies of organic reactions
- Organometallic chemistry
 - including techniques for in situ analysis of reaction intermediates

Contact person for the above topics:

Cathy Dwyer, Tel: (016) 960-2906, Email: cathy.dwyer@sasol.com

- Heterogeneous C1 chemistry
 - including selective syngas, methane and CO₂ conversions
- Refinery catalysis
 - including hydroprocessing, alkylation and aromatics chemistry
- Hydrogenation and dehydrogenation chemistry
- Synthesis, characterisation and evaluation of heterogeneous catalysts
- Kinetic studies of inorganic complexes and reactions in solution
- Corrosion chemistry

Contact person for the above topics:

Thys Botha, Tel: (016) 960-3905, Email: thys.botha@sasol.com

Fischer-Tropsch Catalysis Research

- Surface and/or bulk characterization of metal supported catalysts
 - i.e. XPS, TEM, SEM, XRD, TGA, DSC etc.
- Kinetic and selectivity measurements of Fischer-Tropsch catalysts in micro reactors
- Preparation and manipulation of supported metal alloys on the nano scale
- Porosity and phase control of Al-hydroxides and oxides
- In-situ characterization of FT catalysts
- Impact of reduction promoters on FT catalysts selectivity
- Model components of FT catalysts
- Characterization of alumina surfaces

Contact person for FT Catalysis Research:

Philip Gibson, Tel: (016) 960-2839, Email: Philip.gibson@sasol.com

Fuel Development Research (for Science and Engineering)

- Autoignition Chemistry of fuel and fuel components
- Kinetic modelling of the combustion chemistry of fuel and fuel components
- Laminar flame speed measurement and modelling of fuel and fuel components.
- Thermo-oxidative stability of fuel and fuel components
- Autoxidation modelling and kinetics of fuel and fuel components.
- Electron spin resonance (ESR) of hydroperoxides and fuel degradation products
- Tribology (Viscosity/Lubricity) of low sulfur fuels
- Identification and quantification methods for trace species in fuels
- Chemical class composition of fuels and the impact on stability and other fuel properties

Contact persons for Fuel Development Research:

Chris Woolard, Tel: (021) 650 3247, chris.woolard@sasol.com

Johan Coetzee, Tel: (016) 960 2734, johan.coetzee1@sasol.com

For Fuel and Engine Development research for Mechanical Engineers, please see the “Mechanical Engineering” section.

Coal Processing Technologies (for Science and Engineering)

- Coal devolatilization reaction and product characterisation studies.
- Coal char reactivity and kinetic studies.
- Coal and char structure studies.
- Enhanced understanding of the material science perspective of coal
 - i.e. specialised petrology and RAMAN studies

Within the above broad topics aspects for consideration include the impact of the rank of coal as well as the different carbon constitution (maceral composition), mineral, element composition and particle size of coal.

Coal Science student contact:

Johannes van Heerden, Tel: (016) 960-4298, Email: Johannes.vanheerden@sasol.com

Coal Engineering student contact:

Paul Smit, Tel (016) 960-2464, Email: paul.smit1@sasol.com).

Control Engineering (for Chemical, Electrical and Industrial Engineers)

- Time Delay Estimation with application to best signal design for optimal detection in industrial processes.
- Model Predictive Control
 - finite signal design for least costly plant step testing
- Bio-informatics
 - Leveraging recent advances in bioinformatics in process control
- Constraint management for APC
 - automatic constraint propagation (moving one constraint up when another moves down)
 - support for constraint inference from differing sources (physical constraints, input constraints in output space, etc) and interface of this to existing applications
- Stochastic modelling for control performance prediction and control algorithm development

Contact person for the above topics:

Petri Labuschagne, Tel: (017) 610-7467, Email: petri.labuschagne2@sasol.com

- Data analysis
 - with emphasis on fault detection and dimensional reduction techniques
- Process identification techniques
 - specifically non-linear systems and closed loop identification
- Performance monitoring
 - finding a plant wide performance index

- First principle system modelling.

Contact person for the above topics:

Janus Visagie, Tel: (017) 610-8836, Email: janus.visagie@sasol.com

- Bridging the gap - Model development for plant performance predication
 - Conversion, monitoring the process unit, determining if the plant is sufficiently steady for optimization in real time environment.
- Operator training simulator
 - Development of the first principle based steady state model and deployment of the same as dynamic model for simulation purpose
- Model predictive control
 - application of neural network for inferential development.
- Application of AI (Artificial Intelligence) in model predictive control in process industry.
- Plant data analyses
 - Plant envelope balancing (material balance of individual section of the plant)
 - Study of different techniques for reconciliation of this data to meet the requirements

Contact person for the above topics:

Shirish Choudhary, Tel: (017) 6192241, Email: Shirish.choudhary@sasol.com

Electrical Engineering

- Power quality
- Grounding of generators in industrial power system
- Energy efficiency
- Maintenance strategies
 - power transformers, induction and synchronous motors
- Integrated control between generator excitation system and generator step-up transformer on-load tap changer
- Fault level reduction using ABB Is – Limiter
- Insulation co-ordination
- Reliability of industrial power system (and equipment)
- Line start permanent magnet motors

Contact person for Electrical Engineering:

Keven Semple, Tel: (016) 960 2930, Email: keven.semple1@sasol.com

Environmental Engineering

- Combustion processes
- The incorporation of biofuels into existing petrochemical complexes
- Energy usage optimisation in petrochemical complexes (co-generation, heat exchange)
- Industrial waste treatment modelling
- Life-cycle assessments of petrochemical complexes

Environmental Engineering contact person:

David Kawesha, Tel: (016) 960-3870, Email: david.kawesha@sasol.com

Industrial Engineering

Industrial Engineers in Sasol work in a variety of disciplines and functions that include:

- Supply Chain Management
- Plant Operations Management
- Mining Operations Management
- Information Management
- Business Development

The need for postgraduate study in Industrial Engineering is less focused on fundamental research and more on practical application. The aim would be to solve management problems on a sustainable basis, or conduct projects that result in optimisation relevant to Sasol operations. Students that are interested in postgraduate studies should consult with Sasol to determine the need for research or projects at the time, after which a topic can be formulated. Due to the practical nature of the required research projects, Sasol believes that Industrial Engineering postgraduate studies preceded by some work experience add the most value. Very few bursaries are awarded directly after undergraduate studies are completed, and an award is subject to a panel interview. Sasol also has a study aid program that encourages and supports postgraduate studies after the candidate has gained some work experience. These studies are then usually conducted on a part-time basis.

Industrial Engineering contact person:

Gerrit Kotze, Tel: (017) 614-5620, Email: gerrit.kotze@sasol.com

Mechanical Engineering

- Fuel and Engine Research
 - Acoustic temperature measurements
 - Laminar flame speed measurements
 - Ignition kernel modelling
 - Autoignition modelling and measurement
 - Injection spray imaging
 - HCCI fuel development
 - Jet fuel combustion characteristics
 - Fuel development for downsized engines
 - Fuel effects on engine wear
 - Study of fuel-component-material interactions

Contact persons for Fuel and Engine research:

Gareth Floweday, Tel: (021) 650 5306, gareth.floweday@sasol.com

Andre Swarts, Tel: (016) 960 2560, andre.swarts@sasol.com

- Investigation of stresses built-up during repair of modern materials of construction for the petrochemical industry, e.g. glass reinforced plastic (GRP)
- Implementation of comprehensive repair procedures for structural GRP laminates of composite pipes and vessels for petrochemical industry

Contact person for the above topics:

Oscar Asumani, Tel: (016) 960 5103, Email: oscar.asumani@sasol.com

- Validation of local post weld heat treatment methods for cylindrical shells
 - Finite Element Models
 - Thermal gradients

Contact person for the above topics:

Ashveer Maharaj, Tel: (017) 619 2609, Email: ashveer.maharaj@sasol.com

- Investigation into the design of tall process towers
 - height above 80 m and a slender ratio above 15 (pressure vessels, process towers, columns)
 - CFD analysis and practical validation (including wind tunnel analysis)

Contact person for the above topics:

Tertius Opperman, Tel: (017) 619 2310, Email: tertius.opperman@sasol.com

Process Engineering (for Chemical Engineers)

- Gas-solid fluidization
 - particle characterization [size, shape, density, strength]
 - Mechanisms and quantification of particle break-up
 - Heat and mass transfer
 - CFD/DEM modelling, cyclone performance and modelling
 - Fluidization regime transitions
 - Hydrodynamics of fluidized powder mixtures

Contact person for Fluidization:

Suren Sookai, Tel: (016) 960-2551, Email: suren.sookai@sasol.com

University of Pretoria is recommended for Fluidization research.

- Tar processing research
- Corrosion processes
- Cold model experiments
- Reactor hydrodynamics and modelling
 - CSTR, slurry, fixed bed, plug-flow, trickle-bed, micro-reactors
- Evaluation of Chemical and Refinery processes
 - including numerical performance evaluations, process control, advanced simulations, heuristics, non-equilibrium processes

Contact person for above topics:

Roger Harris, Tel: (016) 960-2763, Email: roger.harris@sasol.com

- Slurry bubble columns
 - Hydrodynamics, mass transfer, dispersion, particle settling
- Filtration
 - filter cake, filter aid PSD, filter aid particle shape, PSD of feed

Contact person for above topics:

Ryan Wolhuter, Tel: (016) 960-4140, Email: ryan.wolhuter@sasol.com

- Chemical Engineering Catalyst Fundamentals
 - Performance evaluations, kinetics, modelling, mechanical integrity, promoters, supports, modifications

Contact person for above topic:

Jean Gauche, Tel: (016) 960-5750, Email: jean.gauche@sasol.com

- Distillation column technology
 - hydrodynamics, distribution, entrainment, heat transfer, packing
- Thermodynamic correlations
 - measurement of system properties and equilibria, improvements to correlations and models
- Separation systems and product purification technology
 - Adsorption, Absorption, Azeotropic distillation, Catalytic distillation, Separation of close-boiling compounds, solvents, molecular sieves

Contact person for above topics:

Braam van Dyk, Tel: (016) 960-3715, Email: braam.vandyk@sasol.com