

UNIVERSITY OF PRETORIA

CURRICULUM VITAE – PROF PIETER SCHALK ELS

(Updated 14 November 2018)

1. BIOGRAPHICAL SKETCH

1.1 GENERAL INFORMATION									
Surname	Els								
First names	Pieter Schalk			ID Number					
Citizenship	RSA			Title	Prof	Female		Male	X
Place of birth	Rustenburg, South Africa			Date of birth			6 September 1968		
Population group	African		Coloured		Indian		White	X	Other <i>(Please specify)</i>
Department	Mechanical and Aeronautical Engineering			Position			Professor		
Direct Telephone	012-420-2045			Direct Telefax			012-362-5087		
E-mail	Schalk.els@up.ac.za								
Date of appointment	01/05/1999			Permanent full-time			X	Temporary full-time	

1.2 ACADEMIC QUALIFICATIONS OBTAINED				
Degree/ Diploma	Field of study	Higher education institution	Year	Distinctions
PhD	Mechanical Engineering	University of Pretoria	2006	Not applicable
M.Eng	Mechanical Engineering	University of Pretoria	1993	Cum Laude
B.Eng	Mechanical Engineering	University of Pretoria	1990	Cum Laude

1.3 WORK EXPERIENCE TO DATE		
Name of employer	Capacity and/or type of work	Period From (mm//yy to mm//yy)
University of Pretoria	Professor	01/16 to present
University of Pretoria	Associate Professor	01/08 to 12/15
University of Pretoria	Senior Lecturer	05/99 to 12/07
Reumech Ermetek	Test Engineer, Senior Test Engineer, Senior Design Engineer	01/94 to 04/99

2. TEACHING ACTIVITIES

2.1 Courses presented		
Course	Level (e.g. second year, Masters)	Self developed (Yes or No)
Dynamics	Second year (2000 to 2002, 2004 to 2012)	No
Vehicle Engineering	Fourth year (1999 to 2018)	Yes
Vehicle Dynamics	Post Graduate (2000)	No
Advanced Vehicle Engineering	Post Graduate (2002, 2004 to 2010)	Yes
Vehicle Dynamics	Post Graduate (2011 to 2018)	Yes

2.2 Other education and pedagogic courses presented		
Course	Year	Institution
Vehicle dynamics	2008	Ismans, Le Mans, France
Vehicle dynamics	2009	Ismans, Le Mans, France
Tire-Vehicle Dynamics Short course (6 hours of lectures – web based)	2013	Virginia Tech, USA

3. TEACHING OUTPUTS

3.1 Educational publications and products
<p>Study guides:</p> <p>Vehicle Engineering (1999 to 2018)</p> <p>Vehicle Dynamics (2000)</p> <p>Advanced Vehicle Engineering (2002, 2004 to 2010)</p> <p>Vehicle Dynamics (2011 to 2018)</p>

4. OTHER TEACHING CONTRIBUTIONS

4.1 Membership of national and international bodies

None

4.2 Visits to local and overseas universities as guest professor or lecturer in regard to teaching

- 1) *Guest Professor teaching a vehicle dynamics course as part of a “Masters degree en race car vehicle engineering” at Ismans in Le Mans, France (2 weeks in 2008 and 2 weeks in 2009)*
- 2) *Tire-Vehicle Dynamics Short course (6 hours of lectures – web based), 2013, Virginia Tech*

4.3 Participation in national and international teaching associations, bodies, committees

ISTVS workgroup on Off-road Vehicle Dynamics and Terramechanics education (chaired workgroup meeting at 2012 ISTVS conference, 24 to 28 September 2012, Pretoria, South Africa)

5. POSTGRADUATE SUPERVISION

5.1 Supervision or co-supervision of students who have completed degrees

Name of student	Degree ¹ /Title of dissertation/thesis and date completed	Supervisor	Co-supervisor(s)	Duration of studies (years)
Doctoral degrees				
U Spangenberg	PhD, Reduction of rolling contact fatigue through control of wheel wear shape, 2017	Prof PS Els	Dr RD Fröhling	3
HA Hamersma	PhD, ABS braking on rough terrain, 2017	Prof PS Els		3
TR Botha	PhD, Digital Image Correlation: Applications in Vehicle Dynamics, 2015	Prof PS Els		3
C Kat	PhD, Validated leaf spring suspension models, 2012	Prof PS Els		3
K Nolte	Doctor Philosophiae, Evaluation of resistance training equipment using three dimensional musculoskeletal modelling focusing on the biomedical and anthropometric considerations of the end-user, 2011	Prof PE Krüger (Biokinetics)	Prof PS Els	4
MJ Thoresson	PhD, Efficient gradient-based optimisation of suspension characteristics for an off-road vehicle, 2007	Dr PE Uys	Dr PS Els	3

¹ Indicate whether Honours, Masters research, Masters coursework with dissertation or Doctorate

Masters Degrees				
NA van der Merwe	Masters research, ABS Braking, 2017	Prof PS Els		1
R Grabe	Masters research, Ride comfort, 2017	Dr C Kat	Prof PS Els	2
GS Heymans	Masters research, Controllable suspension systems, 2016	Prof PS Els	Dr TR Botha	2
JF Grobler	Masters research, MR fluid suspension, 2015	Prof PS Els		3
VH Wehrmeyer	Masters research, Rollover, 2013	Prof PS Els		5
KRS Wright	Masters research, Tyre wear and ageing, 2017	Prof PS Els		2
R Strauss	Masters research, Brake based integrated rollover prevention and yaw control for an off-road vehicle, 2016	Prof PS Els		2
AG Guthrie	Masters research, 3D Computer Vision Contact Patch Measurements Inside Off-road Vehicle Tyres, 2016	Prof PS Els		2
HB Bosch	Masters research, FTire model parameterization and validation of an all-terrain SUV tyre, 2016	Prof PS Els		2
WCW Penny	Masters research, Anti-lock Braking System performance on rough terrain, 2016	Prof PS Els		2
JS Van Den Berg	Masters research, Effects of Friction and Gas Modelling on Vehicle Dynamics Simulation, 2015	Prof NJ Theron	Prof PS Els	4
TP Löwe	Masters research, Modelling of a Passive Hydraulic Steering for Locomotives, 2015	Prof PS Els	Dr C Kat	1
M Kapp	Masters Research, Robust High Speed Autonomous Steering of an Off-Road Vehicle, 2015	Prof PS Els		1
BV Linström	Masters Research, Real-Time Non-Linear Vehicle Preview Model, 2015	Prof PS Els		2
Y Babulal	Masters Research, Large Tyre Testing and Modelling for Handling, 2015	Prof PS Els		4
RF Meeser	Masters Research, Magneto-Rheological (MR) Damper Design for Off-Road Vehicle Suspension with Flow Blocking Ability, 2015	Prof PS Els		4
JM Conradie	Masters Research, Finite Element Modelling of Off-Road Tyres, 2015	Prof PS Heyns	Prof PS Els	4
MJ Stallmann	Masters Research, Tyre parameterisation and modelling, 2014	Prof PS Els		2
A Strydom	M.Eng, Controllable suspension design using Magnetorheological fluid, 2013	Prof PS Els	Dr S Kaul	3
HA Hamersma	M.Eng, Longitudinal vehicle dynamics control for improved vehicle safety, 2013	Prof PS Els		2
SF Van Der Westhuizen	M.Eng, Slow active suspension control for rollover prevention, 2013	Prof PS Els		2
TR Botha	Masters Research, High speed autonomous off-road vehicle steering, 2011	Prof PS Els		1
HGA Breytenbach	Masters Research, Optimal vehicle suspension characteristics for increased structural fatigue life, 2009	Prof PS Els		1
CM Becker	Masters Research, Profiling of rough terrain, 2009	Prof PS Els		2
PH Cronje	Masters Research, Improving off-road vehicle handling using an active anti-roll bar, 2009	Prof PS Els		1
C Kat	Masters Research, Suspension forces on a tri-axle air suspended semi-trailer,	Prof PS Els		1

	2009			
BP Uys	Masters Research, Omrol van Veldvoertuie, "Rollover of off-road vehicles", 2007	Dr PS Els		2
R Bester	Masters Research, The ride comfort vs. handling decision for off-road vehicles, 2007	Dr PE Uys	Dr PS Els	1
C-J Van Eeden	Masters Research, The steering relationship between the first and second axles of a 6x6 off-road military vehicle, 2007	Dr PS Els		5 (Part time)
CL Giliomee	Masters Research, Analysis of a four state switchable hydropneumatic spring and damper system, 2005	Prof JL Van Niekerk	Dr PS Els	7 (Part time, includes Hons)
W Misselhorn	Masters Research, Development of Hardware-in-the-loop testing for vehicle suspension systems, 2005	Prof NJ Theron	Dr PS Els	4 (includes Hons)
MJ Thoresson	Masters Research, Mathematical Optimization of the Suspension of the Suspension System of an Off-Road Vehicle for Ride Comfort and Handling, 2004	Dr PS Els	Dr PE Uys, Prof J Snyman	2
N Janse van Rensburg	Masters Research, Time delay in a semi-active damper, 2000	Prof JL Steyn	Dr PS Els	3

B.Eng (Hons) degrees

A Peenze	B.Eng (Hons), 2017	Prof PS Els		1
F Feldesi	B.Eng (Hons), 2017	Prof PS Els	Dr TR Botha	1
O Scholtz	B.Eng (Hons), 2017	Prof PS Els		1.5
NA van der Merwe	B.Eng (Hons), 2016	Prof PS Els		1
K Poovendran	B.Eng (Hons), 2016	Prof PS Els		1
J Jooste	B.Eng (Hons), 2016	Dr C Kat	Prof PS Els	1
DK Johnson	B.Eng (Hons), 2016	Prof PS Els	Dr TR Botha	1
AG Vosloo	B.Eng (Hons), 2016	Prof PS Els		1
R Grabe	B.Eng (Hons), 2016	Dr C Kat	Prof PS Els	1.5
RA Kapp	B.Eng (Hons), 2015	Prof PS Els		1
KRS Wright	B.Eng (Hons), 2015	Prof PS Els		1
GS Heymans	B.Eng (Hons), 2015	Prof PS Els		1
W Scholtz	B.Eng (Hons), 2015	Prof PS Els		1
JF Grobler	B.Eng (Hons), 2014	Prof PS Els		1
BH Kent	B.Eng (Hons), 2014	Prof PS Els		1
MJR Schoeman	B.Eng (Hons), 2014	Prof PS Els		1
HB Bosch	B.Eng (Hons), 2013	Prof PS Els		1
JC Kruger	B.Eng (Hons), 2013	Prof PS Els		1
AG Guthrie	B.Eng (Hons), 2013	Prof PS Els		1
M Kapp	B.Eng (Hons), 2013	Prof PS Els		1
TP Löwe	B.Eng (Hons), 2013	Prof PS Els		1
WCW Penny	B.Eng (Hons), 2013	Prof PS Els		1
BV Linstrom	B.Eng (Hons), 2012	Prof PS Els		1
VH Wehrmeyer	B.Eng (Hons), 2012	Prof PS Els		1
TR Botha	B.Eng (Hons)	Prof PS Els		1

5.2 Current post-graduate students

Name of student	Degree ² enrolled for and date of first registration	Project title	Supervisor	Co-supervisor(s)	Year of registration
Doctoral degrees					
CM Becker	PhD, 2016	In-situ tyre	Prof PS Els		2016

² Indicate whether Honours, Masters research, Masters coursework with dissertation or Doctorate

		parameterisation			
MJ Stallmann	PhD, 2014	Tyre parameterisation and modelling	Prof PS Els		2014
Masters degrees					
TMG Komana	Masters research, 2018	Tyre pressure control	Prof PS Els		2018
A Peenze	Masters research, 2018	Controllable suspension	Prof PS Els		2018
F Feldesi	Masters research, 2018	Digital Image Correlation	Prof PS Els	Dr TR Botha	2018
O Scholtz	Masters research, 2017	Terrain roughness effects in tyre modeling	Prof PS Els		2017
K Poovendran	Masters research, 2017	Torque vectoring	Prof PS Els	Dr TR Botha	2017
J Jooste	Masters research, 2017	Ride comfort	Prof PS Els	Dr C Kat	2017
DK Johnson	Masters research, 2017	Digital image correlation	Prof PS Els	Dr TR Botha	2017
AG Vosloo	Masters research, 2017	Controllable suspension	Prof PS Els		2017
TC Meyer	Masters research, 2016	Train speed MPC	Prof PS Els	Dr TR Botha	2016
RA Kapp	Masters research, 2016	Distributed Hardware-in-the-loop	Prof PS Els	Dr TR Botha	2016
BH Kent	Masters research, 2015	Longitudinal and lateral vehicle control	Prof PS Els	Dr TR Botha	2015
B.Eng (Hons) degrees					
M Van Der Westhuizen	B.Eng (Hons), 2018		Prof PS Els	Dr C Kat	2018
W Botes	B.Eng (Hons), 2018		Prof PS Els	Dr TR Botha	2018
M Pegram	B.Eng (Hons), 2018		Prof PS Els		2018
K Maake	B.Eng (Hons), 2017		Prof PS Els		2017

6. RESEARCH FUNDING

6.1 Obtaining research funds (Optional)			
Origin of research funds (e.g. contract research, THRIP, international funding organisations, other(s))	Title of research project or programme	Duration	Money allocated (R)
IDIADA			
Caterpillar			
John Deere			
CRREL FTAS			
CSIR Africa Truck			
MHSC Collison Management			
EU Horizon 2020 Marie Curie RISE			
NRF NEP			
European Research Office of the US Army			
NRF Focus Area Programme			
University of Pretoria Research Development Programme			

CSIR DPSS			
CSIR Mobile Intelligent Autonomous Systems (MIAS)			
Denel			
NRF Incentive Funding			
AFRIT			
ARMSCOR			
THRIP			
Cold Regions Research and Engineering Laboratory (CRREL)			
Geotechnical and Structures Laboratory (GSL)			
CSIR DPSS/DARPA			

7. RESEARCH OUTPUTS

7.1 Publications in peer-reviewed or refereed journals

Publications published in peer-reviewed or refereed journals:

1. Spangenberg, U, Fröhling, R.D. and Els, P.S., 2019, Long-term wear and rolling contact fatigue behaviour of a conformal wheel profile designed for large radius curves, *Vehicle System Dynamics*, Volume 57, no. 1, pp.44-63.
2. Van Der Merwe, N.A., Els, P.S. and Žuraulis, V., 2018, ABS Braking on Rough Terrain, *Journal of Terramechanics*, Vol. 80, pp. 49-57.
3. Schreiber, V., Ivanov, V., Augsburg, K., Noack, M., Shyrokau, B., Sandu, C. and Els, P.S., 2018, Shared and Distributed X-in-the-Loop Tests for Automotive Systems: Feasibility Study, *IEEE Access*, Volume 6, pp. 4017- 4026.
4. Linström, B.V., Els, P.S. and Botha, T.R., 2018, A Real-Time Non-Linear Vehicle Preview Model, *International Journal of Heavy Vehicle Systems*, Vol. 25, No. 1, pp. 1-22.
5. Spangenberg, U., Fröhling, R.D. and Els, P.S., 2018, The effect of rolling contact fatigue mitigation measures on wheel wear and rail fatigue, *Wear*, Volumes 398–399, pp. 56–68.
6. Hamersma, H.A. and Els, P.S., 2017, ABS performance evaluation taking braking, stability and steerability into account, *International Journal of Vehicle Systems Modelling and Testing*, Vol. 12, Nos. 3/4, pp.262-283.
7. Kat, C., Johrendt, J.L. and Els, P.S., 2017, Methodology for developing a neural network leaf spring model, *International Journal of Vehicle Systems Modelling and Testing (IJVSMT)*, Vol 12, Nos. 1/2, pp. 94-113.
8. Meeser, R.F., Kaul, S. and Els, P.S., 2017, Investigation into the flow blocking ability of a novel magneto-rheological damper unit, *ASTM Journal of Testing and Evaluation*, Vol. 45 No. 5, pp. 1601-1608.
9. Guthrie, A.G., Els, P.S. and Botha, T.R., 2017, 3D Contact Patch Measurement Inside Rolling Tyres, *Journal of Terramechanics*, Vol 69, pp. 13-21.
10. Hamersma, H.A., Botha, T.R. and Els, P.S., 2016, The dynamic rolling radius of a pneumatic tyre on hard terrains, *International Journal of Vehicle Systems Modelling and Testing*, Vol 11, No. 3, pp. 234-251.

11. Bosch, H.B., Hamersma, H.A. and Els, P.S., 2016, Parameterization and validation of an all-terrain SUV FTire model, *Journal of Terramechanics*, Vol 67, pp.11–23.
12. Spangenberg, U, Fröhling, R and Els, P.S., 2016, Influence of wheel and rail profile shape on the initiation of rolling contact fatigue cracks at high axle loads, *Vehicle System Dynamics: International Journal of Vehicle Mechanics and Mobility*, Volume 54, Issue 5, pp. 638–652.
13. Penny, W.C.W. and Els, P.S., 2016, The test and simulation of ABS on rough terrain, *Journal of Terramechanics*, Vol. 67, pp.1–10.
14. Conradie, J.M., Els, P.S. and Heyns, P.S., 2016, Finite Element Modelling of Off-Road Tyres for Radial Tyre Model Parameterization, *Proc. IMechE, Part D: Journal of Automobile Engineering*, Vol. 230(4), pp. 564–578.
15. Botha, T.R. and Els, P.S., 2015, Digital image correlation techniques for measuring tyre-road interface parameters: Part 1 - Side-slip angle measurement on rough terrain, *Journal of Terramechanics*, Vol 61, pp.87-100.
16. Botha, T.R. and Els, P.S., 2015, Digital image correlation techniques for measuring tyre-road interface parameters: Part 2 - Longitudinal tyre slip ratio measurement, *Journal of Terramechanics*, Vol 61, pp.101-112.
17. Babulal, Y, Stallmann, M.J. and Els, P.S., 2015, Parameterisation and Modelling of Large Off-Road Tyres for On-Road Handling Analyses, *Journal of Terramechanics*, Vol 61, pp. 77-85.
18. Botha, T.R. and Els, P.S., 2015, Rough terrain profiling using digital image correlation, *Journal of Terramechanics*, Vol 59, pp. 1-17.
19. Van Der Westhuizen, S.F. and Els, P.S., 2015, Comparison of different gas models to calculate the spring force of a hydropneumatic suspension, *Journal of Terramechanics*, Vol 57, pp. 41-59.
20. Hamersma, H.A. and Els, P.S., 2014, Improving the braking performance of a vehicle with ABS and a semi-active suspension system on a rough road, *Journal of Terramechanics*, Vol 56, pp. 91-101.
21. Stallmann, M.J., Els, P.S. and Becker, C.M., 2014, Parameterization and Modelling of Large Off-Road Tyres for Ride Analyses: Part 1 - Obtaining Parameterization Data, *Journal of Terramechanics*, Vol 55, pp. 73-84.
22. Stallmann, M.J. and Els, P.S., 2014, Parameterization and Modelling of Large Off-Road Tyres for Ride Analyses: Part 2 - Parameterization and Validation of Tyre Models, *Journal of Terramechanics*, Vol 55, pp. 85-94.
23. Hamersma, H.A. and Els, P.S., 2014, Longitudinal vehicle dynamics control for improved vehicle safety, *Journal of Terramechanics*, Vol 54, pp. 19-36.
24. Ngwangwa, H.M., Heyns, P.S., Breytenbach, H.G.A. and Els, P.S., 2014, Reconstruction of road defects and road roughness classification using Artificial Neural Networks simulation and vehicle dynamic responses: Application to experimental data, *Journal of Terramechanics*, Vol 53, pp. 1-18.
25. Becker, C.M. and Els, P.S., 2014, Profiling of rough terrain, *International Journal of Vehicle Design*, Vol. 64, Nos. 2/3/4, pp. 240-261.

26. Thoresson, M.J., Botha, T.R. and Els, P.S., 2014, The relationship between vehicle yaw acceleration response and steering velocity for steering control, *International Journal of Vehicle Design*, Vol. 64, Nos. 2/3/4, pp. 195-213.
27. Van Der Westhuizen, S.F. and Els, P.S., 2013, Slow active suspension control for rollover prevention, *Journal of Terramechanics*, Vol. 50, 2013, pp.29-36.
28. Nolte, K., Krüger, P.E., Els, P.S. and Nolte, H., 2013, Three dimensional musculoskeletal modelling of the abdominal crunch resistance training exercise, *Journal of Sports Sciences*, Vol. 31, No. 3, pp. 264 - 275.
29. Kat, C. and Els, P.S., 2012, Validation metric based on relative error, *Mathematical and Computer modelling of Dynamical Systems*, Vol. 18, No. 6, October 2012, pp. 487-520.
30. Kat, C. and Els, P.S., 2011, Elasto-plastic leaf spring model, *International Journal of Engineering Systems Modeling and Simulation*, Vol. 3, Nos. 3/4, 2011.
31. Breytenbach, H.G.A. and Els, P.S., 2011, Optimal vehicle suspension characteristics for increased structural fatigue life, *Journal of Terramechanics*, Vol. 48, pp. 397-408
32. Nolte, K., Krüger, E.P. and Els, P.S., 2011, Three dimensional musculoskeletal modelling of the seated biceps curl resistance training exercise focusing on the biomechanical and anthropometric considerations of the end-user, *Sports Biomechanics*, Vol. 10, Issue 2, pp.146-160.
33. Cronje, P.H. and Els, P.S., 2010, Improving off-road vehicle handling using an active anti-roll bar, *Journal of Terramechanics*, Vol. 47, pp. 179-189.
34. Thoresson, M.J., Uys, P.E., Els, P.S. and Snyman, J.A., 2009, Efficient optimisation of a vehicle suspension system, using a gradient-based approximation method. Part 1. Mathematical modelling, *Mathematical and Computer Modelling*, Vol. 50, pp. 1421-1436.
35. Thoresson, M.J., Uys, P.E., Els, P.S. and Snyman, J.A., 2009, Efficient optimisation of a vehicle suspension system, using a gradient-based approximation method. Part 2. Optimisation results, *Mathematical and Computer Modelling*, Vol. 50, pp. 1437-1447.
36. Kat, C. and Els, P.S., 2009, Interconnected air spring model, *Mathematical and Computer Modelling of Dynamical Systems*, Vol. 15, No. 4, August 2009, pp. 353–370.
37. De Wet, G.J., Steyn, J.L. and Els, P.S., 2008, Simulation and experimental verification of solenoid valve characteristics for semi-active damper, *International Journal of Vehicle Design*, Vol. 47, Nos. 1/2/3/4.
38. Els, P.S., Theron, N.J., Uys, P.E. and Thoresson, M.J., 2007, The Ride Comfort vs. Handling Compromise for Off-Road Vehicles, *Journal of Terramechanics*, Vol. 44, pp. 303–317.
39. Theron, N.J. and Els, P.S., 2007, Modelling of a semi-active hydropneumatic spring-damper unit, *International Journal of Vehicle Design*, Vol. 45, No. 4, pp. 501-521.
40. Uys, P.E., Els, P.S. and Thoresson, M.J., 2007, Suspension settings for optimal ride comfort of off-road vehicles travelling on roads with different roughness and speeds, *Journal of Terramechanics*, Vol. 44, pp. 163-175.
41. Uys, P.E., Els, P.S., Thoresson, M.J., Voigt, K.G. and Combrinck, W.C., 2006, Experimental determination of moments of inertia for an off-road vehicle in a regular engineering laboratory,

- The International Journal of Mechanical Engineering Education, Vol. 34, No. 4, pp. 291-314.
42. Els, P.S., Uys, P.E., Snyman, J.A. and Thoresson, M.J., 2006, Gradient-based approximation methods applied to the optimal design of vehicle suspension systems using computational models with severe inherent noise, *Mathematical and Computer Modelling*, Vol. 43, pp. 787-801.
 43. Misselhorn, W.E., Theron, N.J. and Els, P.S., 2006 Investigation of hardware-in-the-loop for use in suspension development, *Vehicle System Dynamics*, Vol. 44, No. 1, pp. 65-81.
 44. Uys, P.E., Els, P.S. and Thoresson, M.J., 2006, Criteria for Handling Measurement, *Journal of Terramechanics*, Vol. 43, pp. 43-67.
 45. Els, P.S., 2005, The Applicability of Ride Comfort Standards to Off-Road Vehicles, *Journal of Terramechanics*, Vol. 42, pp. 47-64.
 46. Giliomee, C.L., Els, P.S. and Van Niekerk, J.L., 2005, Anelastic Model of a Twin Accumulator Hydro-pneumatic Suspension System, *R & D Journal*, July 2005, pp. 11-17.
 47. Els, P.S. and Uys, P.E., 2003, Investigation of the Applicability of the Dynamic-Q Optimisation Algorithm to Vehicle Suspension Design, *Mathematical and Computer Modelling*, Vol. 37, pp. 1029-1046.
 48. Janse van Rensburg, N., Steyn, J.L. and Els, P.S., 2002, Time delay in a semi-active damper: Modelling the bypass valve, *Journal of Terramechanics*, Vol. 39, pp 35-45.
 49. Els, P.S. and Grobbelaar, B., 1999, Heat Transfer Effects on Hydropneumatic Suspension Systems, *Journal of Terramechanics*, Vol. 36, pp. 197-205.
 50. Els, P.S. and Holman, T.J., 1999, Semi-Active Rotary Damper for a Heavy Off-Road Wheeled Vehicle, *Journal of Terramechanics*, Vol. 36, pp. 51-60.
 51. Giliomee, C.L. and Els, P.S., 1998, Semi-Active Hydropneumatic Spring and Damper System, *Journal of Terramechanics*, Vol. 35, pp. 109-117.
 52. Els, P.S. and Grobbelaar, B. 1993, Investigation of the Time- and Temperature Dependency of Hydropneumatic Suspension Systems, SAE Technical Paper Series no. 930265, Published in *Vehicle Suspension and Steering Systems*, SAE Special Publication SP-256, pp. 55-65.

Publications accepted for publication in peer-reviewed or refereed journals:

1. Johnson, D.K., Botha, T.R. and Els, P.S., Real-Time Side-Slip Angle Measurements using Digital Image Correlation, accepted for publication in *Journal of Terramechanics*, Aug 2018.
2. Ivanov, V., Savitski, D., Dhaens, M., Sandu, C. and Els, P.S., Challenges of Integrated Vehicle Chassis Control: Some Findings of the European Project EVE, accepted for publication by The Institute of Electrical Engineers of Japan (IEEJ), 2018.
3. He, R., Sandu, C., Khan, A.K., Guthrie, A.G., Els, P.S. and Hamersma, H.A., Review of Terramechanics Models and Their Applicability to Real-time Applications, accepted for publication in *Journal of Terramechanics*, Apr 2018.

Publications submitted for publication in peer-reviewed or refereed journals:

1. Botha, T.R., Johnson, D.K. and Els, P.S., Real time rut profile measurement in varying terrain

types using digital image correlation, re-submitted to Journal of Terramechanics with minor corrections, 2018

2. Albinsson, A., Bruzelius, F., Els, P.S., Jacobson, B. and Bakker, E., Tire Vibration Considerations in Vehicle Based Tire Testing, submitted for publication in Tire Science and Technology, July 2017.
3. Wright, K.R.S. and Els, P.S., Effects of age and wear on the stiffness and friction properties of an SUV tyre, submitted to Journal of Terramechanics, 2018.
4. Stallmann, M.J. and Els, P.S., Material testing of an off the road (OTR) truck tyre for finite element analysis, submitted for publication in Finite Elements in Analysis & Design, May 2017.
5. Strauss, R. and Els, P.S., Integrated Brake Based Rollover Prevention and Yaw Control of an Off-Road Vehicle, submitted to Vehicle System Dynamics, Feb 2017.

7.2 Books and/or chapters in books

Kolansky, J., Sandu, C., Botha, T.R. and Els, P.S., Multibody Dynamics Techniques for Real-Time Parameter Estimation, Chapter 6.3 of NATO Science for Peace and Security Series D: Information and Communication Security – Vol. 44, Advanced Autonomous Vehicle Design for Severe Environments, ISSN 1874-6268, IOS Press, 2015.

7.3 Published full-length conference papers/keynote addresses

Papers published in conference proceedings

1. Peenze, A. and Els, P.S., Semi-active suspension switching strategies on off-road vehicles for rollover prevention, Proceedings of The joint 10th Asia-Pacific Conference of ISTVS and 39th Annual Meeting of Japanese Society for Terramechanics, Kyoto, Japan, 11-13 July 2018.
2. Becker, C.M. and Els, P.S., Static and dynamic parameterization test rigs for large tyres, Proceedings of The joint 10th Asia-Pacific Conference of ISTVS and 39th Annual Meeting of Japanese Society for Terramechanics, Kyoto, Japan, 11-13 July 2018.
3. Feldesi, F., Botha, T.R. and Els, P.S., Improvement of 3D contact patch measurement using cameras inside rolling tyres, Proceedings of The joint 10th Asia-Pacific Conference of ISTVS and 39th Annual Meeting of Japanese Society for Terramechanics, Kyoto, Japan, 11-13 July 2018.
4. Berndt, A.E., Penny, W.C.W. and Els, P.S., 2017, Investigating Different Vehicle Velocity Estimators and an Adaptive Kalman Filter for Anti-Lock Braking Systems for Off-Road Vehicles, Proceedings of the 19th International & 14th European-African Regional Conference of the ISTVS, Budapest, September 25–27.
5. Botha, T.R., Guthrie, A.G., Jimenez, E., Els, P.S. and Sandu, C., 2017, Tyre Longitudinal Velocity and Slip Measurements from the Inside of a Tyre, Proceedings of the 19th International & 14th European-African Regional Conference of the ISTVS, Budapest,

September 25–27.

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2. Valentin Ivanov, Klaus Augsburg, Dzmitri Savitski, Viktor Schreiber Schalk Els Miguel Dhaens Collaborative Engineering of Integrated Chassis Control for Ground Vehicle - Case study of

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3. Heymans, G.S., Els, P.S. and Grobler, J.F., Physics Based Modeling of a 4-State Semi-Active Suspension System based on MR Fluid Technology, abstract accepted for ASME IDETC 2016
4. Shoop, S., Sopher, A., Botha, T.R., Becker, C.M. and Els, P.S., Digital Image Correlation for Off-Road Mobility, abstract submitted for 2016 Ground Vehicle Systems Engineering and Technology Symposium (GVSETS)

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7.4 Non-refereed publications or popular articles

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7.5 Patents

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7.6 Technical reports

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9. Controllable Wheeled Vehicle Suspension Research Phase II – Final Technical Report, November 2003, (co-authored by Prof NJ Theron)
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52. Toetsverslag: Falcon ewenaar (Test report: Falcon differential), May 1995.
53. Toetsinstruksie: 1B HGT semi-aktiewe demper suspensietoetse (Test instruction: 1B MBT semi-active damper suspension tests), March 1995.
54. Simulasie en eksperimentele ondersoek na semi-aktiewe demping vir die Olifant 1B HGT (Simulation and experimental investigation of semi-active damping for the Olifant 1B MBT), June 1994.
55. Ruspersloopstelseltegnologie: Outomatiese ruspersspanmeganisme (Tracked vehicle running gear technology: Automatic track tensioner mechanism), March 1994.

8. OTHER SCHOLARLY RESEARCH-BASED CONTRIBUTIONS

8.1 Participation in conferences, workshops and short courses - specify type of contribution

Provide full details of participation in national and international conferences etc

8.1.1 National

1. ESTEQ ECC 2018 – presented paper
2. SACAM 2012 – Scientific committee, reviewed 4 abstracts.
3. SACAM 2012 – Session Chair

4. SACAM 2010 – Scientific committee, reviewed 7 abstracts.
5. South African Council for Automation and Computation (SACAC) Post-Graduate Control Systems Day, University of Pretoria, 2 December 2005. Presented a paper.
6. Automotive Noise, Vibration and Harshness, University of Pretoria, 16-17 September 1996. Attended.
7. Mobility short course, October 2001, Pretoria. Presented part of the curriculum.
8. Mathematical optimization short course, University of Pretoria. Attended.
9. Mathematical optimization workshop, University of Pretoria. Attended.

8.1.2 *International*

1. SAE COMVEC 2018, Panel member
2. Member of Program Committee for 10th Asia-Pacific Conference of ISTVS 2018 (AP ISTVS 2018), Kyoto, Japan, 2018.
3. ASME 19th International Conference on Advanced Vehicle Technologies (AVT) Program co-chair for 2017 ASME IDETC conference in Cleveland.
4. Technical Committee Member and Session chair for the 19th International & 14th European-African Regional Conference of the ISTVS, Budapest, September 25–27, 2017.
5. ASME 18th International Conference on Advanced Vehicle Technologies (AVT) Program co-chair for 2016 ASME IDETC conference in North Carolina.
6. Technical Committee Member and Session chair for the 8th Americas Regional Conference of the ISTVS, Detroit, Michigan, September 12-14, 2016.
7. Technical Committee Member and Session chair at the 18th International Conference of the ISTVS, Seoul, Korea, September 22-25, 2014.
8. Technical Committee Member and Session chair/co-chair for two sessions at the 7th Regional Americas Conference of the ISTVS, Tampa, Florida, USA, 4-7 November 2013.
9. Conference organiser of the 12th European Regional Conference of the ISTVS, Pretoria, South Africa, 24 to 28 September 2012.
10. Session chair/co-chair for two sessions at the 17th International Conference of the ISTVS, Blacksburg, USA, 18 to 22 September 2011
11. ASME IDETC/CIE 2011, Washington, DC, 28 to 31 August 2011. Attended and co-authored 2 papers.
12. 17th International Conference of the ISTVS, Blacksburg, USA, 18 to 22 September 2011. Attended, co-authored 5 papers, presented 1 paper, received “Best paper award” in the “Vehicle Dynamics, Mobility and Safety” session.
13. Joint 9th Asia-Pacific ISTVS Conference and Annual Meeting of the Japanese Society for Terramechanics, 27 to 30 September 2010, Sapporo, Japan. Attended, co-authored 5 papers, presented 1 paper.
14. 11th European Regional Conference of the International Society for Terrain Vehicle Systems (ISTVS), 5 to 8 October 2009, Bremen, Germany. Attended, co-authored 4 papers, presented 1 paper.
15. 16th International conference of the International Society for Terrain Vehicle Systems (ISTVS),

25 to 28 November 2008, Torino, Italy. Attended.

16. 20th IAVSD International Symposium: Dynamics of Vehicles on Roads and Tracks, Berkeley, California, 13-17 August 2007, Co-authored 2 postes
17. Advances in Off-road Vehicle Mobility Evaluation, Carleton University, Ottawa, 18-21 August 1997. Attended
18. Fundamentals of Terramechanics and Soil Vehicle Interaction, Cranfield University and Royal Military College of Science, Shrivenham, United Kingdom, 7-8 September 1998. Attended.
19. Workshop on 'Passive and Active Damping – Prospects for the Next Decade', Neu-Ulm/Germany from June 18 to 20, 2001. Presented 1 paper.

8.2 Teamwork and collaboration with others:

Other researchers (national and international)

1. CSIR Defense Peace Safety and Security – Mobile Intelligent Autonomous Systems (MIAS) Research Group
2. Dr Sally Shoop - Cold Regions Research and Engineering Laboratory (CRREL) of the US Army
3. Prof Corina Sandu – Virginia Polytechnic Institute and State University (Virginia Tech)
4. Prof Valentin Ivanov, Ilmenau University of Technology, Germany

Other research institutions (national and international)

1. Collaboration with the Tank Automotive Command (TACOM) of the United States Army on advanced road vehicle suspension research
2. Collaboration with BHP Billiton on rollover assessment
3. CSIR DPSS on vehicle mobility
4. CSIR MIAS on Autonomous vehicle modeling and control
5. Bloodhound SSC (supersonic car), new British land speed record attempt, on terrain profiles and tyre characteristics.
6. ARMSCOR on wheeled vehicle mobility
7. Cold Regions Research and Engineering Laboratory (CRREL) of the US Army ERDC
8. Geotechnical and Structures Laboratory (GSL) of the US Army ERDC
9. Virginia Polytechnic Institute and State University (Virginia Tech)
10. KTH Royal Institute of Technology, Sweden
11. Ilmenau University of Technology, Germany
12. Cosin (Developers of F-Tire), Esslingen, Germany

Industry

1. DCD Rolling Stock
2. Bell equipment
3. Horstman Defense
4. BHP Billiton

5. AFRIT
6. De Beers
7. Denel
8. Gerotek
9. Armscor
10. CSIR DPSS
11. ESTEQ Engineering

8.3 Membership in national and international bodies

1. Editor for Journal of Terramechanics (from August 2014)
2. Member of the Vehicle Design committee (VDC) of the ASME Design Engineering Division (DED), 2012 to present.
3. American Society of Mechanical Engineers (ASME): Member (2011 to present)
4. International Society for Terrain Vehicle Systems (ISTVS):
Deputy General Secretary for Europe-Africa (From 2017)
Member of Board of Directors and Regional Secretary for Africa (from August 2009)
Member 2008 to present
5. Member of the Editorial board of International Journal of Vehicle Systems Modelling and Testing (IJVSMT), (June 2010)
6. SAIMechE (1990 to present)
7. SAE International:
Member (1993 to present)
Baja SAE rules committee (2001 to present)

8.4 Visits to local and overseas universities or research institutes as guest professor or researcher

1. Guest Professor lecturing the vehicle dynamics module of the Masters degree course in Race Car Engineering, Ismans, Le Mans, France, 2008 (2 weeks) and 2009 (2 weeks)
2. Collaborative research with Prof C Sandu at Virginia Polytechnic Institute and State University, 2011 (2 weeks)

9. ARTISTIC OUTPUTS (*if applicable*)

Not applicable

10. MANAGEMENT AND ADMINISTRATIVE DUTIES

Departmental activities

1. Vehicle Dynamics Group (VDG) research group leader (2011 to present)
2. SASOL Baja SAE Challenge / Competition organiser (1999 to 2009)
3. SASOL Baja SAE Faculty Advisor (1999 to present)
4. Vehicle Engineering Laboratory (1999 to present)
5. Management of workshop (2011 to present)
6. Undergraduate portfolio (2010 to 2012)

11. COMMUNITY SERVICE OR PROFESSIONAL SKILLS

11.1 Outreach projects

SASOL Mini Baja competition – Involves Mechanical Engineering students from Universities and Universities of Technology in South Africa, as well as international competitors from the USA, India, Iran and Botswana, Russia, Turkey.

11.2 Professional service performed

Professional registration (e.g. ECSA), Pr Eng (22 May 2003)

Professional Societies, SAE Mini Baja rules committee (2001 to present)

*TV appearances: Mini Baja Topcar programme
Kyknet Mini Baja (24 minutes) (2004, 2005)
e-tv Morning edition Mini Baja (2003, 2004, 2005, 2006)
SABC Morning Live (2003)
Rapid Motion on Supersport (2006,2007,2008,2009)*

*Radio appearances: SABC RSG Interview on Mini Baja Competition
SABC Radio Interview on Mini Baja Competition
SABC SAfm interview on suspension and autonomous vehicles research (2008)*

Mobility Course presented to members of the SANDF and ARMSCOR personnel

11.3 Clinical service

Not applicable

11.4 Involvement with other universities/scientific institutions

1. Opponent for PhD student, Aalto University, Finland, 2016
2. Examiner for M.Eng dissertation, University of Stellenbosch, 2016
3. Examiner for M.Eng dissertation, University of Stellenbosch, 2015

4. Member of PhD committee for a PhD student at Virginia Tech, 2013.
5. Collaborative research with Ilmenau University of Technology, 2011-present
6. Collaborative research with Virginia Polytechnic Institute and State University, 2011-present.
7. Examiner for PhD thesis, Indian Institute of Technology, Bombay, September 2010
8. Examiner for M.Eng dissertation, University of Stellenbosch, February 2009.
9. Examiner for a final year project for University of the Witwatersrand, 2007.
10. Examiner for a final year design for University of the Witwatersrand, 2007.
11. Examiner for M.Eng dissertation, University of Stellenbosch, July 2005.
12. Baja SAE– see above, 1999 to present

11.5 Referee duties

2018:

- 1) Refereed 1 paper for Vehicle System Dynamics
- 2) Refereed 1 paper for International Journal of Vehicle Performance
- 3) Refereed 3 papers for Proc. IMechE, Part D: Journal of Automobile Engineering

2017:

- 1) Refereed 1 paper for Journal of Intelligent Material Systems and Structures
- 2) Refereed 1 paper for Journal of Advanced Transportation
- 3) Refereed 1 paper for Shock and Vibration
- 4) Refereed 1 paper for Tire Science and Technology
- 5) Refereed 1 paper for Measurement
- 6) Refereed 1 paper for Vehicle System Dynamics
- 7) Refereed 1 paper for Mechanical Systems and Signal Processing
- 8) Refereed 4 papers for ISTVS conference
- 9) Refereed 4 papers for ASME IDETC conference

2016:

- 1) Refereed 1 paper for Vehicle System Dynamics
- 2) Refereed 4 papers for ISTVS Conference
- 3) Refereed 2 papers for ASME IDETC
- 4) Refereed 1 paper for Journal of Low Frequency Noise, Vibration and Active Control

2015:

- 1) Refereed 1 paper for Vehicle System Dynamics

2014:

- 1) Refereed 1 paper for International Journal of Acoustics and Vibration
- 2) Refereed 1 paper for ASME Journal of Vibration and Acoustics
- 3) Refereed 4 papers for Journal of Terramechanics
- 4) Refereed 1 paper for Journal of Dynamic Systems, Measurement and Control

- 5) Refereed 1 paper for Nonlinear Dynamics
- 6) Refereed 1 paper for International Journal of Automotive Engineering and Technologies
- 7) Refereed 1 paper for SAE International Journal of Commercial Vehicles

2013:

- 1) Refereed 1 paper for Journal of Terramechanics
- 2) Served on 1 NRF Panel

2012:

1. Refereed 2 papers for Journal of Terramechanics
2. Refereed 4 proposals and served on NRF panel
3. Refereed 1 paper for ASME Journal of Dynamic Systems, Measurement and Control,
4. Refereed 1 paper for British Journal of Applied Science & Technology

2011:

1. Refereed 4 papers for Journal of Terramechanics
2. Refereed 1 paper for International Journal of Vehicle Design
3. Refereed 1 paper for International Journal of Heavy Vehicle Systems
4. Refereed proposals and served on an NRF panel

2010:

1. Examiner for PhD thesis, Indian Institute of Technology, Bombay, September 2010
2. Refereed 4 papers for Journal of Terramechanics
3. Refereed 1 paper for International Journal of Reliability and Safety
4. Refereed 1 paper for CSIR Science real and relevant conference
5. Refereed 1 paper for International Journal of Vehicle Systems Modelling and Testing
6. Refereed 3 papers for SACAM 2010 proceedings.

2009:

1. Refereed a paper for ASTM International Journal of Testing and Evaluation
2. Refereed a paper for Applied Mathematics and Computation (AMC) journal
3. Refereed a paper for Journal of Terramechanics
4. Refereed 7 abstracts for SACAM 2010 conference

2008:

1. Refereed a paper for the "SENSORS" Journal published by "Molecular Diversity Preservation International (MDPI, <http://www.mdpi.org>), Basel, Switzerland.
2. Refereed a paper for International Journal of Vehicle Systems Modelling and Testing (IJVSMT).
3. Refereed 2 papers for Journal of Terramechanics.

2007:

1. Appointed Guest Editor (with N.J. Theron and J.L. Steyn) for International Journal of Vehicle Design (IJVD) Special Issue on: "Extending the Envelope of the Ride-Handling Trade-off".
2. Refereed 2 papers for Journal of Terramechanics.
3. Refereed a paper for HEFAT2007 (5th International Conference on Heat Transfer, Fluid Mechanics and Thermodynamics) conference.
4. Refereed a paper for Journal of Zhejiang University SCIENCE (A&B).

2005:

1. Examiner for M.Eng dissertation, Mr N Behari, Comparison of dynamic models of humans sitting on seats, University of Stellenbosch, July 2005.
2. Refereed Innovation Fund proposal for NRF (Jan 2005).

2001:

1. Refereed a paper for ASME Journal of Dynamic Systems, Measurement and Control.

12. AWARDS AND SCIENTIFIC/SCHOLARLY RECOGNITION

12.1 Evaluation status as scientist/scholar

NRF Rating C2, November 2012.

12.2 Research awards and prizes

1. "Best paper award" at ISTVS 2017, Budapest, for paper: He, R., Khan, A.K., Guthrie, A.G., Sandu, C. and Els, P.S., 2017, A Technical Survey on Terminology, Testing Methodologies, and Equipment Used in Modelling and Parameterization of Soft Soil for Vehicular Applications, Proceedings of the 19th International & 14th European-African Regional Conference of the ISTVS, Budapest, September 25–27.
2. "Best Student Paper" was awarded to 'Measurement of Tire Carcass inside Deformation' by Glenn Guthrie, Theunis Botha, Carl Becker, Schalk Els, Ariana Sopher & Sally Shoop, 8th Americas Regional Conference of the ISTVS, Detroit, USA, 12-14 September 2016
3. "Best paper award" for: Penny, W.C.W. and Els, P.S., Anti-Lock Braking Systems on Rough Terrain, Proceedings of the 13th European Conference of the ISTVS, Rome, Italy, 2015
4. "Best paper award" for: Botha, T.R. and Els, P.S., Kinematic analysis of a tyre rolling over rough terrain using digital image correlation, Proceedings of the 13th European Conference of the ISTVS, Rome, Italy, 2015
5. Best paper award for Bosch, H.B, Hammersma, H.A. and Els, P.S., FTire parameterisation of an SUV tyre, The 18th International Conference of the ISTVS, Seoul, Korea, September 22-25, 2014.
6. ASME Design Engineering Division, Vehicle Design Technical Committee presented the 2014

AVT Best Student Paper Award to Anria Strydom and Schalk Els for their paper entitled "The Applicability of Hybrid Control to a Small Off-Road Vehicle Without a Differential" at the 16th International Conference on Advanced Vehicle Technologies, Buffalo, NY, USA, 18 August 2014.

7. "High recommendation for presentation" at the 7th Regional Americas Conference of the ISTVS, Pretoria, Tampa, Florida, USA, 4-7 November 2013
8. Anria Strydom received the "Best student award" for 2013 from the CSIR DPSS for her research as a CSIR bursar.
9. "Best presentation award" at the 12th European Regional Conference of the ISTVS, Pretoria, South Africa, 24-28 September 2012 for the paper: Kat, C. and Els, P.S., Effect of Hysteresis in Steel Leaf Springs on Ride and Suspension Forces – Preliminary Study.
10. "High recommendation for presentation" at the 12th European Regional Conference of the ISTVS, Pretoria, South Africa, 24-28 September 2012 for the paper: Stallmann, M.J. and Els, P.S., Validation of Mathematical Tyre Models used in Vertical Vehicle Dynamics Simulations.
11. "Best paper award" in the "Vehicle Dynamics, Mobility and Safety" session of the 17th International Conference of the ISTVS, Blacksburg, USA, 18 to 22 September 2011 for the paper: Van Der Westhuizen, S.F. and Els, P.S., Slow active suspension control for rollover prevention (peer reviewed conference proceedings).
12. "Best presentation award" the 11th European Regional Conference of the International Society for Terrain Vehicle Systems (ISTVS), 5 to 8 October 2009, Bremen, Germany. For the paper: Breytenbach, H.G.A. and Els, P.S., Off-road vehicle suspension optimisation for increased structural fatigue life.

12.3 Teaching awards and prizes

None

12.4 Artistic awards and prizes

Not applicable