

UNIVERSITY OF PRETORIA

CURRICULUM VITAE – THEUNIS RICHARD BOTHA

(Updated 1 November 2019)

1. BIOGRAPHICAL SKETCH

1.1 GENERAL INFORMATION									
Surname	Botha								
First names	Theunis Botha			ID Number					
Citizenship	RSA			Title	Dr	Female		Male	X
Place of birth	Pretoria, South Africa			Date of birth			14 July 1986		
Population group	African		Coloured		Indian		White	X	Other <i>(Please specify)</i>
Department	Mechanical and Aeronautical Engineering			Position			PhD student		
Direct Telephone	012-420-3289			Direct Telefax					
E-mail	Theunis.Botha@up.ac.za								
Date of appointment	1 May 2016			Permanent full-time			X	Temporary full-time	

1.2 ACADEMIC QUALIFICATIONS OBTAINED				
Degree/ Diploma	Field of study	Higher education institution	Year	Distinctions
D.Eng	Mechanical Engineering	University of Pretoria	2015	N/A
M.Eng	Mechanical Engineering	University of Pretoria	2011	Cum Laude
B.Eng(Hons)	Mechanical Engineering	University of Pretoria	2009	Cum Laude
B.Eng	Mechanical Engineering	University of Pretoria	2008	Cum Laude

1.3 WORK EXPERIENCE TO DATE		
Name of employer	Capacity and/or type of work	Period From (mm//yy to mm//yy)

2. TUTORING ACTIVITIES

2.1 Courses presented		
Course	Level (e.g. second year, Masters)	Self developed (Yes or No)
Vibration and Noise	Third year (2016, 2017,2018)	No
Control Systems	Fourth year (2019)	No
Mechatronics	Fourth year and Postgraduate(2015, 2016, 2017,2018)	Yes
Physics	First year (2006, 2008)	No
Dynamics	Second year (2010, 2011, 2012, 2013,2016,2017,2018,2019)	No
Advanced Vehicle Engineering	Postgraduate (2011, 2012, 2013, 2014)	No

2.2 Other education and pedagogic courses presented		
Course	Year	Institution

3. TEACHING OUTPUTS

3.1 Educational publications and products
<ul style="list-style-type: none"> • Study guides: <ul style="list-style-type: none"> ○ Mechatronics (2016, 2017,2018,2019)

4. OTHER TEACHING CONTRIBUTIONS

4.1 Membership of national and international bodies
<i>None</i>

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

None

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

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)	
GS Heymans	Masters research, 2016	Controllable suspension systems	Prof PS Els	Dr TR Botha	3
K Poovendran	Masters research, 2017	Brake based Torque vectoring	Dr TR Botha	Prof PS Els	2
J Devin	Masters research, 2017	Real time Digital Image Correlation techniques on vehicles	Dr TR Botha	Prof PS Els	2
RA Kapp	Masters research, 2016	Distributed Hardware-in-the-loop	Prof PS Els	Dr TR Botha	3

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
W Botes	Masters research, 2019	Model Predictive Control for torque vectoring	Dr TR Botha		2019
M Pegram	Masters research, 2019	Strain measurements inside tyre during dynamics test	Dr TR Botha		2019
Kelso Maake	Masters research, 2019	Evaluation Of Cooperative Collision Avoidance Algorithms For Sensor Selection	Dr TR Botha	Dr HA Hamersma	2019
Rory Bennet	Masters research, 2017		Dr TR Botha		2017
J Catterick	Honours 2019		Dr TR Botha	Dr HA Hamersma	2019
R de Sousa	Honours 2019		Dr TR Botha	Dr HA Hamersma	2019
L Fritz	Honours 2019		Dr TR Botha	Dr HA Hamersma	2019
BH Kent	Masters research, 2015	Longitudinal and lateral vehicle control	Prof PS Els	Dr TR Botha	2015

6. RESEARCH FUNDING

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

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

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) (Opt.- exact amounts not required)
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7. RESEARCH OUTPUTS

7.1 Publications in peer-reviewed or refereed journals

Publications published in peer-reviewed or refereed journals:

1. Wright, K.R.S., Botha, T.R. and Els, P.S. 2019. Effects of age and wear on the stiffness and friction properties of an SUV tyre. *Journal of Terramechanics*, 84, pp.21-30.
2. Botha, T., Johnson, D., Els, S. and Shoop, S., 2019. Real time rut profile measurement in varying terrain types using digital image correlation. *Journal of Terramechanics*, 82, pp.53-61.
3. Johnson, D.K., Botha, T.R. and Els, P.S., 2019. Real-time side-slip angle measurements using digital image correlation. *Journal of Terramechanics*, 81, pp.35-42.
4. Ivanov, V., Savitski, D., Augsburg, K., Els, S., Kat, C.J., Botha, T., Dhaens, M., Sandu, C., He, R., McBride, S. and Vazquez, A.G.A., 2019. Challenges of Integrated Vehicle Chassis Control: Some Findings of the European Project EVE. *IEEJ Journal of Industry Applications*, 8(2), pp.218-230.
5. 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*, 25(1), pp.1-22.
6. Guthrie, A.G., Els, P.S. and Botha, T.R., 2017, 3D Contact Patch Measurement Inside Rolling Tyres, *Journal of Terramechanics*, February 2017, Pages 13-21
7. Hamersma, H.A., Botha, T.R. and Els, P.S., The dynamic rolling radius of a pneumatic tyre on hard terrains, accepted for publication in *International Journal of Vehicle Systems Modelling and Testing*, Int. J. Vehicle Systems Modelling and Testing, Vol. 11, No. 3, 2016
8. 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.
9. 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.
10. Botha, T.R. and Els, P.S., 2015, Rough terrain profiling using digital image correlation, *Journal of Terramechanics*, Vol 59, pp. 1-17.
11. 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.

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

Botha, T.R. and Els, P.S. Vehicle centre of mass, roll-centre and pitch-centre height estimation. *Int. J. Vehicle Systems Modelling and Testing* (proofs sent through)

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

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

International conferences of high standing

1. Botha, T.R., Feldesi, F., and Els, P.S. Full-Field Strain Measurements Of The Inside Of An Agricultural Tyre During Static Tests. Proceedings of the ISTVS 15th European-African Regional Conference, Prague, Czech Republic, September 9-11, 2019
2. Pegram, M.S., Botha, T.R. and Els, P.S. Full-Field Strain Measurement Of The Contact Patch Of A Rolling Tyre Via The Inside Tyre Surface. Proceedings of the ISTVS 15th European-African Regional Conference, Prague, Czech Republic, September 9-11, 2019
3. Maake, K.S., Hamersma, H.A., Botha, T.R. and Els, P.S. Evaluation Of Cooperative Collision Avoidance Algorithms For Sensor Selection By Monte Carlo Simulation. Proceedings of the ISTVS 15th European-African Regional Conference, Prague, Czech Republic, September 9-11, 2019
4. Pegram, M.S., Botha, T.R. and Els, P.S., Full-field strain measurement of the contact patch via the inside tyre surface. Proceedings of the IAVSD, Gothenburg, Sweden, August 12-16, 2019
5. Wian, B., Botha, T.R. and Els, P.S. Sideslip Angle Estimation Using a Kinematics Based Unscented Kalman Filter and DIC. Proceedings of the IAVSD, Gothenburg, Sweden, August 12-16, 2019
6. Heyns, P.S., Deetlefs, R., Oberholster, A.J. Botha, T.R. Els, P.S., Diamond, D.H. Computer vision for rail surface defect detection. 16th International Conference on Condition Monitoring and Asset Management, CM 2019; United Kingdom; 25 June 2019 through 27 June 2019
7. Fledesi, F., Botha, T.R. and Els, P.S. Improvement Of 3d Contact Patch Measurement Inside Rolling Tyres. *Proceedings of the 10th Asia-Pacific Conference of the ISTVS, Kyoto, July 11–13, 2018*
8. Noack, M., Botha, T., Hamersma, H.A., Ivanov, V., Reger, J. and Els, S., 2018, March. Road profile estimation with modulation function based sensor fusion and series expansion for input reconstruction. In *Advanced Motion Control (AMC), 2018 IEEE 15th International Workshop on*

(pp. 547-552). IEEE.

9. Hamersma, H.A., Botha, T.R., Els, P.S. 2018. Wheel hop estimation on rough roads. The Dynamics of Vehicles on Roads and Tracks¹, pp. 431-438
10. Guthrie, A.G., Botha, T.R., Jimenez, E., Els, P.S. and Sandu, C. 2017. Dynamic 3d Measurement Of Tire-Terrain Interaction. 14th European Conference of the ISTVS, Hungary, Budapest
11. Johnson, D.K., Botha, T.R., and Els, P.S., C. 2017. Real-Time Slip Angle Measurements Using Digital Image Correlation. 14th European Conference of the ISTVS, Hungary, Budapest
12. Botha, T.R., Guthrie, A.G., Jimenez, E. Els, P.S. and Sandu, C. Tyre Longitudinal Velocity And Slip Measurements From The Inside Of A Tyre. 19th International ISTVS Conference Budapest, September 25-27, 2017
13. Johnson, D.K., Botha, T.R. and Els P.S. Real-Time Slip Angle Measurements Using Digital Image Correlation. 19th International ISTVS Conference Budapest, September 25-27, 2017
14. Botha, T.R., Els, P.S., Shoop, S., Becker, C.M. and Sopher, A. Tire Slip and Slip Angle Measurement in Snow. Proceedings of the 8th ISTVS Americas Regional Conference, Troy, MI, September 12-14, 2016
15. Botha, T.R., Els, P.S., Shoop, S., Becker, C., and Sopher, A. Three-Dimensional Rut Profile Measurement in Snow. Proceedings of the 8th ISTVS Americas Regional Conference, Troy, MI, September 12-14, 2016
16. Guthrie, G., Botha, T.R., Becker, C.M., Els, P.S., Sopher, A., Shoop, S. Measurement of Tire Carcass Inside Deformation. Proceedings of the 8th ISTVS Americas Regional Conference, Troy, MI, September 12-14, 2016
17. Shoop, S., Botha, T.R., Sopher, A., Becker, C.M., Stanley, J. and Els, P.S. Digital Image Correlation for Off-Road Mobility. 2016 NDIA Ground Vehicle Systems Engineering And Technology Symposium. Modeling & Simulation, Testing And Validation (MSTV) Technical Session August 2-4, 2016 - Novi, Michigan
18. Botha, T.R., Els, P.S. Albinsson, A and Jacobson, B.J.H. Vehicle Motion Measurements Using Front Facing Camera and Digital Image Correlation. ASME 2016 International Design Engineering Technical Conferences and Computers and Information in Engineering Conference IDETC2016 August 21-24, 2016, Charlotte, North Carolina
19. Els, P.S., Augsburg, K., Sandu, C., Hopping, K., Stallman, M.J., Botha, T.R., Jimenez, E., Guthrie, A.G., Bernius, V., Wirght, K.R.S. Comparison Of Tire Footprint Measurement Techniques. ASME 2016 International Design Engineering Technical Conferences and Computers and Information in Engineering Conference IDETC2016 August 21-24, 2016, Charlotte, North Carolina
20. Guthrie, A.G., Botha, T.R. and Els, P.S., 3D Computer Vision Inside Off-road Vehicle Tyres, Proceedings of the 13th European Conference of the ISTVS, Rome, Italy, 2015
21. 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
22. Botha, T.R. and Els, P.S., Rut measurement of soft soil terrain using digital image correlation, Proceedings of the 13th European Conference of the ISTVS, Rome, Italy, 2015

23. Guthrie, A.G., Botha, T.R. and Els, P.S., 3D Computer Vision Contact Patch Measurements Inside Off-Road Vehicle Tyres, The 18th International Conference of the ISTVS, Seoul, Korea, September 22-25, 2014.
24. Botha, T.R. and Els, P.S., Rough Terrain Vehicle side-slip angle measurement using digital image correlation, The 18th International Conference of the ISTVS, Seoul, Korea, September 22-25, 2014.
25. Hamersma, H.A., Botha, T.R. and Els, P.S., Kinetic vs. Kinematic Roll Radius on Rough Roads, The 18th International Conference of the ISTVS, Seoul, Korea, September 22-25, 2014.
26. Botha, T.R. and Els, P.S., Three-Dimensional Road Profiling Using Stereography, ISTVS 7th Americas Regional Conference, 4-7 Nov 2013, Tampa, Florida.
27. Els, P.S., Botha, T.R., Hamersma, H.A. Becker, C.M., Savitski, D., Heidrich, L. and Höpping, K., The Effect of Controllable Suspension Settings On the ABS Braking Performance of An Off-Road Vehicle On Rough Terrain, ISTVS 7th Americas Regional Conference, 4-7 Nov 2013, Tampa, Florida.
28. Botha, T.R. and Els, P.S., Tire Longitudinal Slip-Ratio Measurement Using a Camera, abstract submitted to the 2014 ASME International Design Engineering Technical Conferences (IDETC) and Computers and Information in Engineering Conference (CIE), 17-20 August, 2014, Buffalo-Niagara, NY, USA.
29. Kolansky, J., Sandu, C., Botha, T.R. and Els, P.S., Real-Time Vehicle Parameters Estimation, Proceedings of the ASME IDETC/CIE 2013.
30. Botha, T.R. and Els, P.S., 2012, Vehicle Sideslip Estimation Using Unscented Kalman Filter, AHRS and GPS, Proceedings of the ASME IDETC/CIE Conference, Chicago, 12 to 15 August 2012.
31. Botha, T.R. and Els, P.S., 2012, Road Friction Estimation using Stereography, Proceedings of the 12th European Regional Conference of the ISTVS, Pretoria, South Africa, 24 to 28 September 2012 (peer reviewed).
32. Botha, T.R., Els, P.S. and Becker, C.M., 2012, Measuring Tyre Contact Patch Deformation using Stereography, Proceedings of the 12th European Regional Conference of the ISTVS, Pretoria, South Africa, 24 to 28 September 2012 (peer reviewed).
33. Botha, T.R. and Els, P.S., 2011, Profile optimisation of table top speed hump for speed control, Proceedings of the ASME IDETC/CIE 2011, Washington, DC, 28 to 31 August 2011 (peer reviewed).
34. Botha, T.R. and Els, P.S., 2011, High speed autonomous off-road vehicle steering, Proceedings of the 17th International Conference of the ISTVS, Blacksburg, USA, 18 to 22 September 2011 (peer reviewed).

35. Botha, T.R. and Els, P.S., 2010, High Speed Autonomous Off-Road Vehicle Steering, Proceedings of the Joint 9th Asia-Pacific ISTVS Conference and Annual Meeting of the Japanese Society for Terramechanics, 27 to 30 September 2010, Sapporo, Japan.

Conferences of lesser standing

36. Botha, T.R., Guthrie, A.G., Stallmann, M.J. and Els, P.S. The Use of Digital Image Correlation in Tyre Research. 10th South African Conference on Computational and Applied Mechanics Potchefstroom 3 – 5 October 2016

37. Botha, T.R. and Els, P.S., 2012, High Speed Autonomous Off-Road Vehicle Steering, 8th South African Conference on Computational and Applied Mechanics, 3-5 September 2012, Johannesburg, South Africa.

Conference abstracts/papers accepted

Feldesi, F. Botha, T.R. Els, P.S. Improvement Of 3d Contact Patch Measurement Inside Rolling Tyres. 10th Asia-Pacific Conference of the ISTVS, Kyoto, Japan (2018)

Conference abstracts submitted

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:

7.4 Non-refereed publications or popular articles

7.5 Patents

1. *Please note that your Provisional patent application with reference : UPTTOP has been captured in the electronic Patent Register, and the official application number 2016/05967 has been officially allocated. For any enquiries regarding this application click here. or visit the CIPC website.*

7.6 Technical reports

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. SACAM 2016 – Session Chair
2. SACAM 2012 – Authored and presented 1 paper

8.1.2 International

3. 18th International Conference of the ISTVS, Seoul, Korea, September 22-25, 2014. Co-authored and presented 3 papers
4. 12th European Regional Conference of the ISTVS, Pretoria, South Africa, 24 to 28 September 2012. Authored and presented 2 papers
5. ASME IDETC/CIE 2012, Chicago, IL, 10 to 12 August 2012. Authored and presented 1 paper
6. ASME IDETC/CIE 2011, Washington, DC, 28 to 31 August 2011. Authored and presented 1 paper
7. 17th International Conference of the ISTVS, Blacksburg, USA, 18 to 22 September 2011. Attended, Authored and presented 1 paper
8. Joint 9th Asia-Pacific ISTVS Conference and Annual Meeting of the Japanese Society for Terramechanics, 27 to 30 September 2010, Sapporo, Japan. Attended, Authored and presented 1 paper

8.2 Teamwork and collaboration with others:

Other researchers (national and international)

1. Prof Bengt Jacobson –Chalmers University of Technology, Sweden
2. Dr Barys Shyrokau – Technical University Delft, Netherlands
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. Cold Regions Reserch Engineering Laboratory) of the US Army ERDC
2. Chalmers, Sweden
3. CSIR DPSS on vehicle mobility
4. Geotechnical and Structures Laboratory (GSL) of the US Army ERDC
5. Virginia Polytechnic Institute and State University (Virginia Tech)
6. Ilmenau University of Technology, Germany

Industry

1. Gerotek
2. CSIR DPSS
3. ESTEQ Engineering
4. Transnet

8.3 Membership in national and international bodies

Member of International Society of Terrain Vehicle Systems 2015- 2018

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

1. Collaborative research with Prof Valentin Ivanov at Ilmenau University of Technology, Germany, 2013 (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

11. COMMUNITY SERVICE OR PROFESSIONAL SKILLS

11.1 Outreach projects

11.2 Professional service performed

11.3 Clinical service

Not applicable

11.4 Involvement with other universities/scientific institutions

1. Collaborative research with Chalmers University of Technology, 2015-present
2. Collaborative research with Delft University of Technology, 2015
3. Collaborative research with Ilmenau University of Technology, 2013-present
4. Collaborative research with Virginia Polytechnic Institute and State University, 2011-present.

11.5 Referee duties

2012:

1. Refereed 3 papers for ASME International Design and Engineering Technical Conferences & Computers and Information in Engineering Conference (IDETC/CIE)
2. Refereed 1 paper for International Society of Terrain Vehicle Systems

12. AWARDS AND SCIENTIFIC/SCHOLARLY RECOGNITION

12.1 Evaluation status as scientist/scholar

12.2 Research awards and prizes

1. Soehne-Hata-Jurecka (S-H-J) Award, 2017. This award is presented to a distinguished member of the ISTVS who is forty-years old or younger on 31 March, 2017 and who has outstandingly contributed to the ISTVS and the field of Terra-mechanics
2. Sasol medal for best masters dissertation in 2011 in the department of mechanical and aeronautical engineering, University of Pretoria

12.3 Teaching awards and prizes

None

12.4 Artistic awards and prizes

Not applicable