

SCHOOL: Mathematics, Statistics and Computer Sciences			
COLLEGE: CAES			
CURRICULUM VITAE			
NAME: Sudan Hansraj		POSITION TITLE: Senior Lecturer Dr.	
Email: hansrajs@ukzn.ac.za			
EDUCATION/ TRAINING			
INSTITUTION AND LOCATION	DEGREE	YEAR(s)	FIELD OF STUDY
Springfield College of Education	JSED (dip)	1984 - 86	Math/ Physical Science
UNISA, Pretoria	BSc	1990 - 1992	Math/ Appl Math
UNISA, Pretoria	Bsc (HONS)	1993 - 1994	Mathematics
University of Natal, Durban	MSc	1996 - 1996	General Relativity
University of Natal, Durban	PhD	1997 - 1999	General Relativity

A. Positions and Honours.

2000: Gold Medal: South African Mathematics Olympiad Committee, Year 2000 commemoration for contribution to Mathematics.

2001: Award by AMESA-KZN for contribution to the development of Problem Solving in the province of Kwazulu Natal.

2002: KZN Department of Education commendation for achieving a 100% pass rate in Additional Mathematics. Students taught part-time.

Chairman of the Organising Committee on behalf of the Republic of South Africa for the hosting of the Pan African Mathematics Olympiad (2002). Funding granted by FEST (now NRF). Chairperson of the Problems Committee.

Member of the Statistical Moderation Panel of the South African Certification Council (now UMALUSI) (Standards Body) 2002 - 2005.

Member of the South African Committee for the International Mathematics Olympiad (2000 - 2007).
Member of the Coaching staff of the SA IMO.

South African Team Leader for the Pan African Mathematics Olympiad (2003) in Ougadougou, Burkina

Faso.

KZN Team Leader to the Asian Mathematics Olympiad (Hong Kong 1998 - 2000)

Invited Speaker at the Symposium of the Olympiads Commission of the Pan African Mathematics Olympiad (Abeokuta, Nigeria, 2004). Presented paper.

Appointed as Adviser , by the Pan African Commission on Olympiads African Mathematical Union, to the Mozambique Education Department on their hosting of the 13th Pan African Mathematics Olympiad in 2005.

Executive Member of the Harmony Gold South African Mathematics Olympiad (1997 - 2007).
Independent mathematician on the 3rd Round Olympiad Committee by invitation (1999 - 2007).

Founding member of the South African Mathematical Foundation (SAMF). Original founding document drafted with Professor JKC Engelbrecht, University of Pretoria). 2004.

Invited Lecture: Mathematics for Undergraduate Teaching Initiative (MUTI) University of Pretoria, 2006.
Invited by Prof Ansie Harding.

Founding member of the South African Gravitation Society. 1999

Member of the Local Organising Committee of the Einstein Centennial Meeting 2005 at UKZN with Prof SD Maharaj and Prof. KS Govinder. Preparation of Book of Abstracts

Member of the South African Mathematical Society. (1997 - present)

Invited to conduct Teacher Training Lectures at Swakopmund, Namibia (2004)
Invited to conduct Olympiad Training Programme at the International School in Mbabane, Swaziland (2005)

Chairperson: Association of Mathematics Education of South Africa (Problem Solving Committee) 1997 - 2007; Represented AMESA on Board of Suid Afrikaanse Akademie vir Wetenskap en Kuns (1996 - 2005).

Chief Organiser of the South African Interprovincial Mathematical Olympiad (2008, 2010, 2011, 2012).

Member of the Organising panel and Problems committee of the South African Tertiary Mathematics Olympiad.

Served on the Local Organising Committee of Southern Right Delta Conference, Cape Town, 2009.
Proposed name: Mathematics for a Dynamic Environment" - accepted by LOC.

2010: Invited by Vice Chancellor of WITS University Professor Loyiso Nongxa, via Dean of Humanities Prof K Tawana, to serve as RESPONDENT to Professor Deborah Eyre (UK) at a symposium entitled: 'High Potential Youth in Marginalized Communities'.

2013: Invited Plenary Lecture: Namibian Mathematics Conference (May 22 - 25) Windhoek, Namibia.

Member of the UMALUSI COUNCIL ASSESSMENT STANDARDS COMMITTEE (2002 - 2006 and 2013 to date)

Vice Chair: South African Mathematics Olympiad Management Committee 2014. Member since 1997.

B. RESEARCH: Peer-reviewed publications

PUBLICATIONS IN MATHEMATICS/ APPLIED MATHEMATICS

1. *Group analysis of a conformal perfect fluid spacetime* (Govinder, K. S.; Hansraj, S.) *Journal of Physics A - Mathematical and Theoretical* Volume: 45 Issue: 15 Published: 2012 **Impact Factor: 1.766**
2. *Perfect fluid metrics conformal to the Schwarzschild exterior spacetime* (Hansraj, S), *General Relativity and Gravitation* Volume: 44 Issue: 1 Pages: 125-138 2012 **Impact Factor: 2.069**
3. *Analysis of a charged Schwarzschild sphere* (Hansraj, S.) *Nuovo Cimento Della Societa Italiana Di Fisica B-Basic Topics in Physics* Volume: 125 Issue: 1 Pages: 71-87 Published: 2010 (Now European Physical Journal Plus) **Impact Factor: 1.302**
4. *Charged analogue of Finch-Skea stars* (Hansraj, S.; Maharaj, S. D.) *International Journal of Modern Physics D* Volume: 15 Issue: 8 Pages: 1311-1327 Published: 2006 **Impact Factor: 1.180**
5. *Lie symmetries for equations in conformal geometries* (Hansraj, S.; Maharaj, S. D.; Msomi, A. M.; et al.) *Journal of Physics A-Mathematical and General* Volume: 38 Issue: 20 Pages: 4419-4431 Published: 2005 **Impact Factor: 1.766**
6. Hansraj S, Calculus Free Optimisation, *For the Learning of Mathematics*, Vol 30 (2), July 2010, Alberta, Canada. Pp 26 - 31.
7. Hansraj S: The AMESA-KZN Mathematics Challenge 2000, *Notices of the South African Mathematical Society*, 31, pages 200 - 203.
8. Hansraj S: The Development of Problem Solving Ability in Post - Apartheid South Africa, *KwaZulu-Natal Mathematics Journal*, Feb 2003, pp16 - 24.
(Also in *Proceedings of the 15th International Conference on the Teaching of Collegiate Mathematics*, Orlando, Florida, 2002)
9. Hansraj S: The importance of Mathematical Talent in the Development of Africa - in Report on the African Mathematical Union Pan African Mathematics Olympiad Symposium, 2005 by Prof. N El Yacoubi (Editor)
10. Hansraj S, Heideman NJH and van Zyl, K: *Enjoying Mathematics* - Book published by South African Mathematics Foundation, Pretoria, 2005. 160 page book. ISBN: 1-920080-01-5 (Translated into Afrikaans as *Wiskunde Genot*)
11. Hansraj S and Pillay P: *The Love of Mathematics* - Book published by South African Mathematics Foundation, Pretoria, 2007. 180 page book. ISBN: 1-920080-07-4
12. *Book Review: Hansraj S: The Method of Coordinates: IM Gel'fand; EG; AA Kirillov for: The Mathematical Gazette* (UK Mathematics Society), 2002.
13. *Book Review: Hansraj S: Exploring, Investigating and Discovering in Mathematics: V Berinde, Birkhäuser Verlag, 2004.*

14. Hansraj S: *Mathematical Modelling of Phenomena in Relativistic Astrophysics* Journal of Applied Global Research - JAGR, Volume 6, Issue 16 (Spring 2013).
15. *Algorithmic Construction of Exact Solutions for Neutral Perfect Fluid Spheres* by S. Hansraj and DD Krupanandan - International Journal of Modern Physics D - **Impact Factor: 1.180**
16. *Conformal Mappings in Relativistic Astrophysics* by S. Hansraj, KS Govinder and N. Mewalal: Journal of Applied Mathematics **Impact Factor: 0.834**
17. *Incompressible Einstein-Maxwell fluids with specified electric fields*, S. Hansraj; S. D. Maharaj; T. Mthethwa Pramana . 10/2013; 81(4):557-567. DOI: 10.1007/s12043-013-0603-7 **Impact Factor: 0.72**
18. *Plane symmetric relativistic fluids with Taub geometry* by S. Hansraj European Physical Journal P. 10/2013; 128(10). DOI: 10.1140/epjp/i2013-13120-3 **Impact Factor: 1.48**
19. *Generating Interior Sources for the Reissner-Nordström Metric*, S. Hansraj; S. D. Maharaj; T. Mthethwa International Journal of Theoretical Physics. 10/2013; DOI: 10.1007/s10773-013-1864-0 **Impact Factor: 1.19**
20. *n--Dimensional Isotropic Finch--Skea Stars B. Chilambwe (Phd student), S. Hansraj* The European Physical Journal - Plus EPJP-D-14-00752R1 to appear. **Impact Factor:1.48**

ARTICLES SUBMITTED AND UNDER REVIEW

1. *Exact Solution for Perfect Fluids in 5-D Einstein-Gauss-Bonnet Gravity* by S. Hansraj, SD Maharaj and BC Chilambwe
2. *New Models of Perfect Fluids in Modified Gravity Theories* by S. Hansraj, SD Maharaj and BC Chilambwe

C. Research Support

1. NRF Thuthuka Grant (2005 - present): Exact Solutions of the Einstein Maxwell Field Equations. (Finance Code RB48)
2. Competitive Research Grant (UKZN): (2003/2004) Applications of Lie Group Analysis in obtaining exact solutions of the Einstein Field Equations - one paper resulted and several conference presentations. (Finance Code 7685)
3. International Mathematics Olympiad Grant from the Murray Trust: Purpose - to develop a training programme for teachers in Problem Solving Techniques. One week programme hosted at UND in collaboration with Professor Nic Heideman (UCT) and Professor Sizwe Mabizela (Rhodes). 20 Teachers and 3 instructors were accommodated at UND courtesy of the grant. (Finance Code H450 IMO)

D. Teaching

UNDERGRADUATE AND POSTGRADUATE TEACHING (UKZN)

University of Natal Faculty of Education

2002 to 2003: Senior Lecturer in Mathematics Education

Courses taught:

Undergraduate First to 4th Year Undergraduate Mathematics for Education (BEd)

Post Graduate: MEd in Mathematics Education (Course work sections)

University of Natal/ Kwazulu Natal

2002 to 2012: Senior Lecturer in Mathematics

Courses taught: Mathematics 1A (Calculus); Mathematics 1B (Calculus)

Mathematics 2A (Multivariable Calculus);

Mathematics 2B (Intermediate Linear Algebra and Laplace Transforms and Differential Equations)

Mathematics 3A (Fourier Analysis)

Post Graduate Teaching

Graduated Students: (all by dissertation)

1. Ms N. Mewalal (Msc Mathematics) - KS Govinder co-supervisor
2. Mr. DD Krupanandan (Msc Applied Mathematics)
3. Mr. SM Mlaba (Msc Applied Mathematics) - SD Maharaj co-supervisor
4. Mr. RT Mthethwa (Msc Applied Mathematics) - SD Maharaj co-supervisor
5. B. Chilambwe (PhD under examination)

Current Students:

1. Mr. S Mlaba (PhD App Math)
2. Ms N. Mewalal (PhD Math)
3. Mr. DD Krupanandan (PhD App Math)

Math Education:

Taught MEd (Mathematics) - 15 students with Mr. D. Luthuli (2002/ 2003) - Edgewood Campus

Teaching Innovation:

Since 2007 I have been exploiting tablet PCs in the effective teaching of large (500+) Engineering classes. The advantage of this method is that lectures are saved electronically onto a course website and are available for download by students who may have missed key points in the live lecture. Additionally the course website is well populated with supplementary support materials including current and past lectures, past test and examination papers with the solutions, extra reading material/ books relevant to the subject matter, embedded *youtube* videos and self made videos on aspects students have found difficulty in. Teaching videos on selected problem areas are easily made with the aid of Adobe Captivate software and with no further need of hardware besides a ThinkPad. The technology rich teaching experience is enhanced by the use of social media communication strategies such as Twitter and Facebook mainly for the posting of reminders but also for answering questions in a manner transparent to all the students. Students have appreciated the hi-tech teaching system and have reacted negatively to staff members who do not engage in same but rely solely on traditional teaching methodologies.

TEACHING (OTHER NON-UKZN/ UND)

High School Teaching

1987 to 1990: Secondary School Mathematics at Centenary Secondary (40 distinctions in 4 years)

1990 to 1993: Secondary School Mathematics at Trenance Park Secondary (serving as HOD)

College of Education Teaching

1994 to 1996: Lecturer in Mathematics and Mathematics Education at Springfield College of Education:
Courses taught: Mathematics and Didactics of Mathematics for the Secondary and Primary Phase
1996 to 2001: Lecturer in Mathematics and Wiskunde at the Durbanse Onderwysekollege.
Courses taught: Mathematics and Mathematics Education for the Secondary and Primary School
in English and Afrikaans

Teaching Publications:

1. Hansraj S, Calculus Free Optimisation, *For the Learning of Mathematics*, Vol 30 (2), July 2010, Alberta Canada. Pp 26 - 31.
2. Hansraj S: The AMESA-KZN Mathematics Challenge 2000, *Notices of the South African Mathematical Society*, 31, pages 200 - 203.
3. Hansraj S: The Development of Problem Solving Ability in Post - Apartheid South Africa, *KwaZulu-Natal Mathematics Journal*, Feb 2003, pp16 - 24.
(Also in Proceedings of the 15th International Conference on the Teaching of Collegiate Mathematics, Orlando, Florida, 2002)

BOOKS (MATHEMATICS EDUCATION)

- Hansraj S, Heideman NJH and van Zyl, K: *Enjoying Mathematics - The South African Mathematics Olympiad 1995 - 2002 (JUNIOR)* published by South African Mathematics Foundation, Pretoria, 2005. 160 page book. ISBN: 1-920080-01-5
- Hansraj S and Pillay P: *The Love of Mathematics: The South African Mathematics Olympiad 1995 - 2005 (SENIOR)* published by South African Mathematics Foundation, Pretoria, 2007. 180 page book. ISBN: 1-920080-07-4

BOOKS TO SUPPORT HIGH SCHOOL MATHEMATICS TEACHING

- ISBN 978-0-9814153-0-7 TurboMaths Grade 12 New FET, Hansraj, S (2002 -2014), 200 pages
- ISBN 978-0-9814153-1-4 TurboMaths Grade 11 New FET, Hansraj, S (2002 -2014), 190 pages
- ISBN 978-0-9814153-2-1 TurboMaths Grade 10 New FET, Hansraj, S (2002 -2014), 190 pages
- ISBN 978-0-9814153-3-8 Turbo Mathematical Literacy Grade 12, Hansraj, S (2002 -2014), 220 pages
- ISBN 978-0-9814153-4-5 Turbo Mathematical Literacy Grade 11, Hansraj, S (2002 -2014), 180 pages
- ISBN 978-0-9814153-6-9 TurboPhysics Grade 12 New FET Govender M, Abel K and Hansraj, S (2002 -2014), 225 pages

PUBLISHED BOOK REVIEWS AND JOURNAL REVIEWS

- The Method of Coordinates: IM Gel'fand; EG; AA Kirillov for: *The Mathematical Gazette* (UK Mathematics Society), 2002.
- Exploring, Investigating and Discovering in Mathematics: V Berinde, Birkhäuser Verlag, 2004.
- Review on Saez-Ballester theory of gravity (scalar field) - CP Singh, et al, for *Pramana* (2008)
- Review on article on 'Conversions and treatments...' for *Journal Pythagoras* (2012)

E. SERVICE TO UNIVERSITY

- Member of the Faculty of Science Board (2006 to 2011)
- Represented the School of Mathematical Sciences in the Engineering Faculty Examinations Board (200/ 7/ 8)
- Served on panel of School during the Review of the School of Mathematical Sciences. Compiled the Outreach section of the School report. (2008)
- Served as School representative on Selection Committees (2010)
- Represented the School at the Library Committee Meeting (2009)
- Organises regular free seminars for school learners to develop a fondness for Mathematics (2004 to present)
- Assist at the Open Day for Mathematics Department
- Gives regular inspirational lecture during the Faculty of Engineering Winter School (2009, 2010, 2011, 2012) on behalf of the School of Mathematical Sciences.
- Member of the NTESU (2002 to present)
- Represented the School in official extra-University meetings eg. The National Benchmarking process for entry level exams for universities held at Simonstown in 2009.
- Coordinated and compiled the School's report to Professor Piet Human (2010) on the revised curriculum for mathematics FET.
- Hosts numerous symposia for primary and high school children each year to stimulate an interest in mathematics.
- Serves as Academic Leader for Mathematics and Applied Mathematics (2011/2012 and 2014 to present)
- Represents the College at the University Institutional Forum.
- Member of the School Board of Mathematics, Statistics and Computer Science
- Member of the School Board of the School of Engineering (2011/ 2012)

Recent Conferences and Visiting Appointments

1. Presentation at Central Indian Research Institute, Nagpur, **India** - December 1997.
Topic: Conformal Transformations in General Relativity
2. GR15: International conference on General Relativity and Gravitation held at IUCAA, Pune, **India** in December 1997.
3. Hanno Rund Conference at University of Natal: Gravitation and Cosmology June 1994/ 1996
4. Conference of the Southern African Relativity Society (SARS) held in **Pretoria** (February 1997)
5. General Relativity meeting during 1996 at University of **Zululand** - Founding of SARS - Relativity Society
6. AMESA National Conference held at University of Natal in July 1997. Presented Problem Solving Workshop.
7. Represented AMESA - KZN at Olympiad Workshop in **Cape Town** - April 1996
8. Participated as lecturer in the International Mathematics Olympiad Training Camp at the University of **Stellenbosch** - December 1996. **Potchefstroom** University (2001); **Rhodes** University (2001).
9. Team Leader for the **Hong Kong** Olympiad (1998; 1999; 2000).
10. Appointed Team Leader of South African team to the Pan African Mathematics Olympiad (**Burkina Faso** - August 2001)
11. Presentation at 15th International Conference on the Teaching of Collegiate Mathematics, **Orlando, Florida, USA**. November 2002.

12. Pan African Mathematics Olympiad Symposium 2005: **Abeokuta, Nigeria** April. Title of Talk: "THE IMPORTANCE OF MATHEMATICAL TALENT IN THE ECONOMIC DEVELOPMENT OF AFRICA"
13. January 2004: Conducted Teacher Training programme on Mathematics Olympiad in **Namibia**.
14. June 2005: Conducted Teacher Training programme on Mathematics Olympiad in **Swaziland**.
2006: Advisor to Mozambique PAMO, **Maputo, Mozambique**.
15. Jul 2005: TALK: Einstein Century International Conference organised by Observatoire de Paris (JM Alimi), **Paris, France**. Talk: Conformal Transformations in General Relativity.
16. 2006 December: Research Visit: TATA INSTITUTE FOR FUNDAMENTAL RESEARCH (**Mumbai**, India) and Jamia Milia University (**Delhi**)
17. Presented paper at the International Conference of Cybernetics, July 2007, Orlando Florida, USA.
18. Research Visit to the Inter-University Centre for Astronomy and Astrophysics, **Pune, India** as a guest of the Director. April 2008.
19. Visiting Senior Lecturer to IUCAA, **India** during December, 2010. Talk on Incompressible Fluid Spheres.
20. South African Mathematics Society Annual Congress - University of **Cape Town** (2009 - talk on Petrov Type III spacetime geometry), University of Pretoria (2010), University of Stellenbosch (2012 - talk on Einstein-Gauss-Bonnet gravity theory).
21. International Conference of the Indian Association of General Relativity in **Goa**, December 2011. Presented poster on Conformal Schwarzschild geometry.
22. Conference of the South African Gravitation Society, **Cape Town** (2010) - talk on Conformal Geometry.
23. Meeting of the UKZN Astrophysics and Cosmology group (ACRU) at **Sani Pass, Drakensburg** 18-22 December 2009.
24. Meeting of UKZN Relativity group at **Richards Bay**, April 2011.
25. Meeting of the UKZN ACRU group at **Sani Pass**, 2007.
26. Community Outreach Conference organised by Humanities Faculty at **Makaranga Lodge, Kloof**, 2011
27. Meeting of the UKZN ACRU group at Drakensburg Gardens, 21 - 24 September 2012.
28. Guest Lecture at the Siyanqoba Mathematics training project for the SAMF (August 2012)
29. Talk at South African Mathematical Society Congress November 2012 at University of **Stellenbosch**. Title: Exact Interior Solutions in Einstein-Gauss-Bonnet Theory.
30. Talk at Intellectbase Conference: "Mathematical Modelling of Phenomena in Relativistic Astrophysics" - 13 - 15 December 2012, Las Vegas, USA.
31. Plenary Talk at Namibian Mathematics Conference (22 - 25 May 2013)
32. Visiting Scientist: Inter-University Centre for Astronomy and Astrophysics, Pune, India. December 2014. Professor Ajit Kembhavi, Director, host.
33. Invited Lecture: Tata Institute for Fundamental Research, Mumbai, India. December 2014. Professor Gopakumar, host.
34. Visiting Scientist: Indian Institute of Science Education and Research, Kolkata. December 2014. Professor Narayan Banerjee, Indian relativity and gravity society President.
35. Invited member of the Coordination Committee at the 2014 International Mathematical Olympiad hosted by South Africa at UCT. Professor John Webb Chair.
36. GE 75: Conference in honour of Professor George Ellis (75th) held at University of Cape Town. November 2014. Attended.
37. Invited speaker: Conference in honour of Professor NK Dadhich (70th) held at the Jamia Milia University, Delhi, India. Talk on Exact solutions in Einstein-Gauss-Bonnet gravity.

International Collaboration

- Professor Naresh Dadhich (ex Director Inter-University Centre for Astronomy and Astrophysics, Pune, India)
- Professor Sushant Ghosh, Director, Jamia Milia University, Delhi, India
- Professor Sanjay Jhingan, Jamia Milia University, Delhi
- Professor SM Wagh, Director, Central Indian Research Institute
- Professor Sailo Mukherjee, IUCAA, Pune, India
- Dr. Xian Otero Camanho, Max-Planck-Institut für Gravitationsphysik, Albert-Einstein-Institut, 14476 Golm, Germany

Plenary and Invited Lectures

1. Plenary talk of the Independent Examinations Board Mathematics Conference in 2003.
2. Invited to give talk at Mathematics for Undergraduate Teaching Initiative (MUTI) at University of Pretoria. 2007.
3. Plenary Lecture: At Abeokuta University, Nigeria. 5 - 10 April 2005. African Mathematical Union (PAMO Commission)
4. Served as Advisor to Mozambique on their inaugural hosting of the Pan African Mathematics Olympiad - Invited by Chair of African Mathematical Union PAMO Commission. 2006.
5. Plenary Talk at Namibian Mathematics Conference (22 - 25 May 2013)

National Service to Mathematics

1. National Organiser and Chief Examiner of the South African Interprovincial Mathematics Olympiad (now SA Team Challenge) - under the auspices of the South African Mathematics Foundation.
2. Academic Leader for Mathematics Teacher Development Project organised by the SAMF. Development of 5 courses complete with manuals and DVDs to promote Problem Solving skills amongst high school teachers.
3. Member of the Organising Panel of the South African Tertiary Mathematical Olympiad.
4. Served as Statistical Moderator for the UMALUSI (ex South African Certification Council) 2002 to 2006 and 2013 to date.
5. Member of the SA Committee for the International Mathematical Olympiad (2002 to 2007).
6. Chairman of the Local Organising Committee for PAMO 2002, Pretoria, South Africa.
7. National Moderator of the South African Mathematical Olympiad Final Round (Senior).
8. Moderator of the South African Mathematical Olympiad Final Round.

Referees

- Professor S.D Maharaj (UKZN) maharaj@ukzn.ac.za (Former HOD, UKZN)
- Professor D. Baboolal (UKZN) baboolald@ukzn.ac.za (Former HOD, UKZN)
- Professor J. Banasiak (UKZN) banasiak@ukzn.ac.za (Former HOD, UKZN)
- Professor P. Pillay (pillayph@ukzn.ac.za) Senior Mathematician at UKZN
- Professor KS Govinder (govinder@ukzn.ac.za) Dean and Head of School at UKZN
- Professor JH Webb (john.webb@uct.ac.za) Senior Mathematician at UCT and Secretary of the International Mathematical Olympiad

- Professor J Engelbrecht (johann.engelbrecht@up.ac.za) Vice Principal (former) of University of Pretoria and Executive Director of the South African Mathematics Foundation
- Professor L. Nongxa (Loyiso.Nongxa@wits.ac.za) Vice-Chancellor of Wits University (former)