Shambhu N. Sharma, PhD

Associate Professor

Department of Electrical Engineering

SV National Institute of Technology

Surat, India, 395007

E-mails: snsvolterra@gmail.com, sns@eed.svnit.ac.in

DoB: 01:02:1972

Academic References

(i) Professor Harish Parthasarathy, Signal Processing, control, mathematical physics, Formerly with IIT Mumbai, presently with NSIT Delhi, India.

(ii) Professor Shiva Shankar, Mathematical control theory, Formerly with Stony Brook University, New York and IIT Mumbai, presently with Chennai Mathematical Institute, Chennai, Tamilnadu, India.

Degrees

B.E. Electrical Engineering**,** Govt. Engineering College Rewa, M.P., India, February 1994.

M.Tech. Control Systems (Electrical Engineering)**,** Institute of Technology, Banaras Hindu University (Presently IIT (BHU)), UP, India, April 2000.

Ph.D. Volterra and stochastic system theory**,** the University of Delhi, Delhi, India, December 2007.

(My thesis was defended on Saturday, December 29, 2007. External examiner: Dr. R K P Bhatt, Professor, Electrical Engineering, Indian Institute of Technology, Delhi, India).

Regular Job experience (permanent positions)

(i) *NSIT Delhi (An Autonomous Institution of Govt. of NCT of Delhi, Formerly Delhi Institute of Technology, Kashmeri Gate, New Delhi)*

Lecturer (Instrumentation and Control Engineering Division)

July 26, 2000- December 31, 2005

(ii) *NSIT Delhi (An Autonomous Institution of Govt. of NCT of Delhi, Formerly Delhi Institute of Technology, Kashmeri Gate, New Delhi)*

Assistant Professor (Instrumentation and Control Engineering Division)

January 1, 2006- March 31, 2009

(iii) SV *NIT Surat, Gujarat* (*An Institution of National Importance, Govt. of India*)

Associate Professor (Electrical Engineering Department)

April 1, 2009- till date

Research highlights

Recognitions and Known for: A stochastic system, '*The Sharma-Parthasarathy stochastic two-body problem'*.

The following paper, Shambhu N. Sharma and H. Parthasarathy

Dynamics of a stochastically perturbed two-body problem. *Pro. R. Soc. A,* The Royal Society: London, 463, pp.979-1003, 2007. (doi: 10.1080/rspa.2006.1801),

was published in the Royal Society Journal.

A string of papers in various international Journals follows that. Stochastic researchers described this stochastic system as '*The Sharma-Parthasarathy stochastic two-body problem'*.

http://scitation.aip.org/content/aip/journal/jmp/56/3/10.1063/1.4906908

We developed *new and appealing non-linear Kalman stochastic filtering Theorems* with their proofs. That have found applications to real physical systems as well. Interestingly, we have introduced the non-linear *Kalman* filtering into dynamic circuits as well.

Interestingly, we have introduced the 'Stratonovich differential' into non-linear dynamic circuits that obeys consensus on the Itô versus Stratonovich. That was not available in literature.

Notably, another contribution of our research is to bring the theory of stochastic processes in autonomous systems, dynamic circuits as well as radio astronomy involving *formal* stochastic interpretations, which are relatively very *scarce* in physics and engineering literature, in lieu of informal stochastic interpretations. The formal stochastic interpretations of our research are Itô and Stratonovich stochastic calculi.

White noise process is a generalized stochastic process. That is an informal, non-existent time-derivative of the Brownian motion process.

A review of the paper, *International Journal of Control*, 79(9), pp. 1096-1106, 2006, added to the database of the Math Reviews, MR 224 2909(2007f: 93113) 93 E 11(60H 10) of *American Mathematical Society*.

Of interest

Shambhu N Sharma, and Balaji G Gawalwad**,** Wiener meets Kolmogorov**,** *Norbert Wiener in the 21st Century* (Thinking machines in physical word), a historical-technical paper, IEEE (CSS) and IEEE (SSIT) IFAC Conference, July 13-Jul 15, 2016, University of Melbourne, Australia . http://ieeexplore.ieee.org/stamp/stamp.jsp?arnumber=7547457

Broader Research interest

Broadly, I am interested in the following:

(i) Stochastic systems theory

(ii) Control theory

(iii) Applications of stochastic filtering theory to satellite dynamics, networked control, switched electrical networks, Autonomous Underwater Vehicles (AUVs)

(iv) Probability theory, stochastic processes and stochastic differential equations

(v) Linear algebra and matrix theory

(vi) Control and mathematics education

Future research interests

I am also interested in the celebrated works of

(i) S R S Varadhan

(ii) H J Kushner

(iii) Adam Swartz

(iv) M Vidyasagar.

Our research is inspired from the recommendation of David Mumford, the dawning of the age of stochasticity. http://www.dam.brown.edu/people/mumford/beyond/papers/2000b--DawningAgeStoch-NC.pdf

The Brownian motion, the celebrated Itô theory, the Kolmogorov forward equation and the Kolmogorov backward equations are the major ingredients of our papers. It is worthwhile to state succinctly the historic accounts and the success of the Brownian motion process and the Itô theory, a formal theory of the Brownian motion. The age of the Brownian motion is 112 years that began from Albert Einstein, AN Kolmogorov and finally, the Kiyoshi Itô developed the Itô calculus. The celebrated Itô theory is the *Inaugural Gauss prize* recipient in 2006. Broadly, the Itô differential rules, the Fokker-Planck-Kolmogorov equation, the Kolmogorov backward equation, the Kushner-Stratonovich equation, Stratonovich differential, the Riccati equation, Kalman filtering, Hamilton-Jacobi-Bellman equations are the key words of our research.

I am looking for bright, committed PhD and Post-DoCs students aspiring for pursuing their research career in control theory. Candidates with interests in control theory and Control Engineering with Linear algebra, probability theory, and applied mathematics are encouraged to apply for the PhD program of the Department-Institute.

Courses Taught at Undergraduate Level at NSIT Delhi

(i) Control systems 1

(ii) Circuits and systems

(iii) Random signals

(iv) Principle of electrical engineering

(v) Electrical measurements

(vi) Robotics

(vii) Electrical engineering and Measurement lab

(viii) Control engineering lab

(ix) Electrical workshop

Courses Taught at Postgraduate Level at NSIT Delhi

(i) Random processes in estimation and control

(ii) Adaptive control systems

(iii) Robotics

(iv) Discrete-time control systems

(v) Estimation theory lab

Courses Taught at Undergraduate Level at NIT Surat, Gujarat, India

(i) Circuits and systems

(ii) State variable analysis, an *Institute-level elective*

(Run by Electrical Engineering Department, National Institute of Technology, Surat, India)

(iii) Discrete-time control systems

(iv) Non-linear control systems

(v) Control engineering lab

Courses Taught at Postgraduate Level at NIT Surat, Gujarat, India

(i) System theory fundamentals

My method of teaching hinges on the notion that complex, cryptic concepts, which have greater conceptual depth and ageless beauty, must be well taught with full clarity and simplicity.

International scientific activities, session chairing and Refereeing

(1) Offered the position of a *Visiting Fellow* in the School of Technology and Computer Science (STCS, TIFR Mumbai, India), Feb 4, 2009.

(2) An invited session *Co-Chairing*, *9th IFAC (International Federation of Automatic Control) symposium on Control of Power and Energy Systems December 9-11, 2015*. Indian Institute of Technology, Delhi, India.

(3) *Questioner*, the 46th ISCIE *(The Transactions of Institute of Systems, Control and Information Engineers)* International Symposium on Stochastic Systems Theory and its Applications, Kyoto Institute of Technology (KIT), Kyoto, Japan, *November 1, 2014.*

(4) *Questioner*, the 46th ISCIE *(The Transactions of Institute of Systems, Control and Information Engineers)* International Symposium on Stochastic Systems Theory and its Applications, Kyoto Institute of Technology (KIT), Kyoto, Japan, *November 2, 2014*.

(5) The session *Chair*, 2013 MSC (*Multi-Conference on Systems and Control*), An IEEE Control Systems Society event, Hyderabad, India, August 28, 2013.

(6) The session *Chair*, the 2013 SICE *(Japanese Society of Instrument and Control Engineers*), Nagoya University, Japan, September 15, 2013.

(7) Reviewer, *Proceedings of the Royal Society A*: Mathematical, Physical and Engineering Sciences, the UK's National Academy of Sciences, London, UK.

(8) Reviewer, *International Journal of Control*, UK.

(9) Reviewer, *Non-linear Dynamics* (An international Journal for dynamics and control), Springer: the Netherlands

(10) Reviewer, *Proceedings of the National Academy of Sciences* (PNAS Journal), United States of America.

(11) Reviewer, *Neurocomputing, an Elsevier Journal*

(12) Reviewer, *Robotics and Autonomous Systems*

(13) *Reviewer*, the 55th IEEE *Conference on Decision and Control* (CDC), Las Vegas, USA, December 12-14, 2016.

(14) Reviewer, *4th International Conference on Advances in Control and Optimization of Dynamical Systems* (An IFAC Conference), February 1-5, 2016, NIT Tiruchirappalli, India.

(15) Reviewer, *the 2016 European Control Conference (ECC),* July 15-17, 2016, Aalborg University, Aalborg, Denmark.

(16) Reviewer, the 2016 *Indian Control Conference* (ICC), Indian Institute of Technology Hyderabad, January 4-6, 2016.

(17) Reviewer, the 54th IEEE *Conference on Decision and Control*(CDC), Osaka International Convention Center, Osaka, Japan, December 15-18, 2015.

(18) Reviewer, *the 27th Chinese Control and Decision Conference (CCDC),* Qingdao, China during, May 23-May 25, 2015.

(19) Reviewer, *the 2015 European Control Conference (ECC),* Johannes Kepler University, Linz, Austria, July 15-17, 2015.

(20) Reviewer, *9th IFAC symposium on Control of Power and Energy Systems December 9-11, 2015*. Indian Institute of Technology, Delhi, India.

(21) Reviewer, MED'14, *22nd Mediterranean Conference on Control and Automation*, University of Palermo, Italy, July 16-19, 2014.

(22) Reviewer, *the 19th IFAC World Congress*, International Federation of Automatic Control, Cape Town, South Africa, 24-29 August 2014.

(23) Reviewer, *the 2013 American Control Conference (ACC),* June 17-19, Washington, DC, United States of America.

(24) Reviewer, *the 2012 American Control Conference (ACC),* Montreal, Canada, June 26-28, 2012

(25) Reviewer, *the 16th IFAC (International Federation of Automatic Control) Symposium on System Identification*, Brussels, Belgium, 2012.

(26) Reviewer for the track 4, Dynamics, Control and Uncertainty, of *the 2012 ASME International Mechanical Engineering Congress and Exposition* (IMECE 2012), Houstan, Texas, United States of America

(27) Reviewer, *International Journal of Mechatronics and Automation*, Inderscience Publishers (www.inderscience.com).

(28) Reviewer, *IETE Journa*l, India

(29) Reviewer, *International Journal of Biomechatronics and Bio Robotics*

(30) Received numerous invitations for organizing and chairing special sessions for other international conferences as well.

(31) Invited to interact with Editors of *Control Engineering Journals*, an IFAC conference, Milan, August 31, 2011.

Some selected presentations, invited talks, *conference presentations* at International and domestic institutions

(i) An invited talk, Electrical Engineering and Computer Science Department, Indian Institute of Science Education and Research, Bhopal (IISERB), March 27, 2017.

Title of the talk: Non-linear stochastic filtering from control perspectives

Audience: PhD students, Researchers and Faculty members

(ii) An invited talk, Computer Science Department, Rajiv Gandhi Prodyogiki Vishvavidyalay (RGPV), Bhopal, March 28, 2017.

Title of the talk: Markov processes: a brief survey

Audience: M Tech, PhD students, and Faculty members

(iii) An *invited* talk, Electrical Engineering Department, National Institute of Technology, Kurukshetra, Harayana, India, August 27, 2015.

Title of the talk: The ubiquity of control systems

Audience: M Tech., PhD students, Faculty members

(iv) An *invited* talk, Graduate School of Information and Physical Sciences, *the Osaka University,* Japan, November 4, 2014.

Title of the talk: A Kushner-Stratonovich stochastic method for non-linear dynamical systems,

Audience: PhD students, Post-DoC students and Faculty members

(v) An *invited* talk, Electrical Engineering Department, National Institute of Technology, Kurukshetra, Harayana, India, May 19, 2016.

Title of the talk: Control systems: preliminaries, challenges and solutions

Audience: M Tech., PhD students, Faculty members

(vi) An *invited* talk, Electrical Engineering Department, *Indian Institute of Technology,* Banaras Hindu University, October 20, 2014.

Title of the talk: Future directions in control

Audience: M Tech., PhD students, Faculty members

***(vii) Norbert Wiener in the 21st Century* (Thinking machines in physical word),** July 13-Jul 15, 2016, An IEEE-IFAC Control Conference, University of Melbourne, Australia.

Paper title: Wiener meets Kolmogorov

Audience: Conference presenters, i.e. International young and senior Control Researchers

(viii) *The 27th Chinese Control and Decision Conference (CCDC),* Qingdao, China, May 25, 2015.

Title of the paper: On a phase tracking problem: continuous-discrete filtering

Audience: Conference presenters, i.e. International young and senior Researchers

(ix) The 46th ISCIE (Institute of Systems, Control and Information Engineers) *International Symposium on Stochastic Systems Theory and its Applicatio*ns, Kyoto Institute of Technology (KIT), Kyoto*, Japan*, November 2, 2014.

The tile of the paper: On the stochasticity of a machine swing equation using Itô differential

Audience: Conference presenters, i.e. young and senior stochastic Researchers

(x) Department of Computer Engineering, Indian Institute of Technology (Banaras Hindu University), Uttar Pradesh, India, March 19, 2014.

The tile of the talk: Markov processes: a brief survey

Audience: M Tech., PhD students.

(xi) The 45th ISCIE (Institute of Systems, Control and Information Engineers) International Symposium on Stochastic Systems Theory and its Applications, *University of the Ryukyush, Okinawa, Japan*, November 2, 2013.

The title of the paper: On the theory of a time-varying bilinear Stratonovich stochastic differential system and its application to a dynamic circuit

Audience: Conference presenters, i.e. International young and senior stochastic Researchers

(xii) The SICE 2013 (the Japanese Society of Instrumentation and Control Engineers), *Nagoya University, Japan,* September 15, 2013.

The title of the paper: A non-linear switched system, the Lagrangian method and Itô theory

Audience: Conference presenters, i.e. International young and senior Researchers

(xiii) Department of Electrical and Computer Engineering, College of Engineering, *University of Saskatechwan (U of S)*, Saskatoon, Canada, March 19, 2012.

The title of the talk: The Fokker-Planck equation in satellite dynamics

Audience: U of S young and senior Researchers

(xiv) Department of Electrical Engineering, National Institute of Technology, Surat, India, February 24-February28, 2014.

Audience: Paricipants, i.e. young and senior Researchers

(xv) Department of Electronics and Communication Engineering, National Institute of Technology, Surat, India, February 27- February28, 2014.

Audience: Paricipants, i.e. young and senior Researchers

(xvi) Department of Electrical Engineering, National Institute of Technology, Surat, India, January 28- February1, 2013.

Audience: Paricipants, i.e. young and senior Researchers

(xvii) Department of Applied Mathematics, National Institute of Technology, Surat, India, June 10, 2013.

(xviii) Department of Applied Mathematics, National Institute of Technology, Surat, India, March 19, 2013.

(xiv) Department of Civil Engineering, National Institute of Technology, Surat, India, March 16, 2013.

(xv) The International Conference CONIAPS-XIV, National Institute of Technology, Surat, December 2011.

(xvi) Department of Applied Physics, National Institute of Technology, *Surat*, India, February 3, 2010.

(xvii) Department of Civil Engineering, National Institute of Technology, *Surat*, India, December 23, 2009.

(xviii) Department of Electrical Engineering, *IIT Kharagpur,* India, October, 2008

(xix) Division of Instrumentation and Control Engineering, *NSIT Delhi*, June 20, 2003.

(xx) Division of Instrumentation and Control Engineering, *NSIT Delhi*, June 25, 2003.

(xxi) Division of Instrumentation and Control Engineering, *NSIT Delhi*, Dec. 30, 2003.

A compiled list of Journals, selected Conferences and Symposia contributed

(1) *Proceedings of the Royal Society* A: Mathematical, Physical and Engineering Sciences, *(one paper)*

(A Journal of the Royal Society, UK's National Academy of Sciences, the *oldest Science Academy* of the world in continuous existence, that published the Schrodinger wave equations, Maxwell's equations of electromagnetics as well)

(3) *The ASME (American Society of Mechanical Engineers) Transactions*, Journal of Computational and Non-linear Dynamics *(Two papers)*

(4) *Automatica*, a Journal of International Federation of Automatic Control (IFAC), *(one paper)*

(Ranked as the highest impacted among control Journals of the IFAC)

(5) *Transactions of the Institute of Systems, Control and Information Engineers (ISCIE) (Two papers)*

(6) *International Journal of Control*, *(one paper)*

(7) *Journal of the Franklin Institute (JFI) (one paper)*

(The *second oldest* peer reviewed science Journal of the United States of America. Rudi Kalman, Norbert Wiener, Max-Planck, and Albert Einstein had published their research articles in the Journal)

(8) *European Journal of Control (one paper)*

(The Journal of the European Union Control Association *EUCA*)

(9) *Circuits, Systems and Signal Processing* (CSSP) Journal *(one paper)*

(10) *Differential Equations and Dynamical Systems*, a mathematics and statistics Journal *(two papers)*

(11) *Non-linear Dynamics*, an International Journal of Dynamics and Control *(two papers)*

(12) *Applied Mathematics and Computations*, a mathematics Journal (*three papers)*

(13) *Fluctuation and Noise Letters*, an Interdisciplinary Scientific Journal on Random Processes in Physical, Biological and Technological Systems *(one paper)*

(14) *System Sciences and Control Engineering,* a Taylor and Francis Journal, an invited paper *(one paper)*

(15) *Journal of Control Engineering and Applied Informatics* (an SCI Journal) (two papers)

(16) *International Journal of Dynamics and Control*, a Springer Journal *(one paper)*

(17) *Nova Science Publishers*, USA *(two papers)*

(18) *2016* IEEE (CSS) and IEEE (SSIT) IFAC Conference on *Norbert Wiener in the 21st Century* (one paper)

(19) *The 2012 Multi-Conference on Systems and Control (MSC)*, An IEEE Control Systems Society Conference (*one paper)*

(20) *The 2013 Multi-Conference on Systems and Control (MSC),* An IEEE Control Systems Society Conference, *(one paper)*

(21) *3rd International Conference on Systems and Control*, An IEEE Control Systems Society Conference *(two papers)*

(22) *The SICE (The Japanese Society of Instrumentation and Control Engineers) Annual Conference 2013,* Nagoya University, Nagoya, Japan. *(one paper)*

(23) The *45th ISCIE* (the Institute of Systems, Control and Information Engineers) International Symposium on Stochastic Systems Theory and its Applications, *University of the Ryukyush, Okinawa, Japan*, November 2, 2013. *(one paper)*

(24) *The 19th World Congress of International Federation of Automatic Control (IFAC)*, Cape Town South Africa, August 24-28, 2013. *(One paper)*

(25) *Third International Conference on Advanced Control and Optimization in Dynamical Systems* (IFAC Papers On-Line database), Indian Institute of Technology, Kanpur, India. *(One paper)*

(26) The *46th ISCIE* (the Institute of Systems, Control and Information Engineers) International Symposium on Stochastic Systems Theory and its Applications, Kyoto Institute of Technology (KIT), Kyoto*, Japan*, November 1-2, 2014. *(One paper)*

(27) *The 27th Chinese Control and Decision Conference (CCDC),* Qingdao, China during, May 23-May 25, 2015. (One paper)

(28) *9th IFAC symposium on Control of Power and Energy Systems*, Delhi, India, December 9-11, 2015. *(One paper)*

(29) *The Fourth International Conference on Advanced Control and Optimization in Dynamical Systems* (an IFAC Conference), National Institute of Technology, Trichy, India. *(One paper)*

(30) *20th International Conference on System Theory, Control and Computing*, 13- 15 October 2016, Sinaia, Romania**.**

Journal Publications of Shambhu N. Sharma

Authoring statistics: four papers (single Authored), sixteen (double authored), one (triple authored)

(1)**Shambhu N. Sharma**, H. Parthasarathy and J.R.P. Gupta

Third-order approximate Kushner filter for a non-linear dynamical system, *International Journal of Control*, 79(9), pp. 1096-1106, 2006. (doi: 10.1080/00207170600800124).

(2) **Shambhu N. Sharma** and H. Parthasarathy

Dynamics of a stochastically perturbed two-body problem. *Pro. R. Soc. A,* The Royal Society: London, 463, pp.979-1003, 2007. (doi: 10.1080/rspa.2006.1801).

http://www.journals.royalsoc.ac.uk/(wjaizyfakgeqz0mjruuqw0jt)/app/home/contribution.asp?referrer=parent&backto=issue,2,9;journal,1,137;linkingpublicationresults,1:102023,1

(3) **Shambhu N. Sharma**, and H. Parthasarathy

A two-body continuous-discrete filter, *Non-linear Dynamics* (An international Journal for dynamics and control), Springer: the Netherlands, 51(nos. 1-2), 155-170, 2008 (doi: 10.1007/s11071-007-9199-0).

http://www.springerlink.com/content/174pww5131633735/

(4) **Shambhu N. Sharma**, and H. Parthasarathy

Volterra series arising from the discrete Schrodinger wave equation in Hilbert space, *Applied Mathematics and Computation* (an Elsevier Journal), 196, pp. 563-569, 2008. (doi: 10.1016/j.amc.2007.06.030)

http://dx.doi.org/10.1016/j.amc.2007.06.030

(5) **Shambhu N. Sharma**

Non-linear filtering for a dust-perturbed two-body model, *Non-linear Dynamics* (An international Journal for dynamics and control), Springer: the Netherlands, 55, pp.221-238, 2008 (doi: 10.1007/s11071-008-9358-y).

http://www.vtex.lt/pws/index.php/index/index

(6) **Shambhu N. Sharma**

A Kolmogorov-Fokker-Planck approach for a stochastic Duffing-van der Pol system, *Differential Equations and Dynamical Systems*: Mathematics and Statistics (An International Journal for Theory, Applications, Computer Simulations), 16(4), pp. 351-377, October, 2008. DOI: 10.1007/s12591-008-0019-x.

http://www.springerlink.com/content/t5315t2k62154151/

(7) **Shambhu N. Sharma**

A Kushner approach for small random perturbations of a stochastic Duffing-van der Pol system, *Automatica* (a Journal of IFAC, International Federation of Automatic Control), 45, pp. 1097-1099, 2009.

http://dx.doi.org/10.1016/j.automatica.2008.12.010

(8) **Shambhu N Sharma**

A connection between multi-linear and Volterra systems, *Applied Mathematics and Computation* (an Elsevier Journal), 216 (7), 1918-1922, 2010. **http://dx.doi.org/10.1016/j.amc.2010.01.120**.

(9) Hiren G Patel and **Shambhu N. Sharma**

Some evolution equations for an Ornstein-Uhlenbeck process-driven dynamical system, *Fluctuation and Noise Letters* (An SCIE Journal on 'Random Processes in Physical, Biological and Technological Systems'), 11(4), 1250020-39, 2012. http://www.worldscientific.com/doi/abs/10.1142/S0219477512500204.

(10) Hiren G Patel and **Shambhu N. Sharma, "**Third-order continuous-discrete filtering equations for a non-linear dynamical system," *The ASME(The American Society of Mechanical Engineers) Transactions*, Journal of Computational and Non-linear Dynamics, 9(3), 034502-9, July 2014. doi:10.1115/1.4026064.

http://computationalnonlinear.asmedigitalcollection.asme.org/article.aspx?articleid=1783649

(11) Hiren G Patel and **Shambhu N. Sharma**, "Filtering for a Duffing-van der Pol stochastic differential equation," *Applied Mathematics and Computation* (an SCI Journal), 226, 386–397, 2014.

http://www.sciencedirect.com/science/article/pii/S0096300313010953

(12) Nanasaheb S Patil and **Shambhu N Sharma**, A prediction theory for a coloured noise-driven stochastic differential system, *System Sciences and Control Engineering* (a Taylor and Francis Journal), 2 (1), 342-350, 2014.

(13) Nanasaheb S Patil and **Shambhu N Sharma**, Some new results on bilinear stochastic systems, *Journal of Decision and Control,* a Taylor and Francis Journal. DOI: 10.1080/23307706.2014.960135.

(14) Nanasaheb S Patil and **Shambhu N Sharma**, On the mathematical theory of a time-varying bilinear Stratonovich stochastic differential system and its application to two dynamic circuits, *Transactions of the Institute of Systems, Control and Information Engineers,* vol 27, no.12, 485-492, 2014.

(15) Balaji G Gawalwad and **Shambhu N Sharma**, Coloured noise analysis of a phase-locked loop system: beyond Itô and Stratonovich stochastic calculi, *Differential Equations and Dynamical Systems*: Mathematics and Statistics (An International Journal for Theory, Applications, Computer Simulations), vol 24 (2), 231-245, 2016. DOI: 10.1007/s12591-014-0212-z.

(16) Nanasaheb S Patel and **Shambhu N. Sharma,**

On a non-linear stochastic dynamic circuit using Stratonovich differential, *Journal of the Franklin Institute* (Special Issue on Advances in Nonlinear Dynamics and Control), volume 352, issue 8, 2999–3013, August 2015.
doi:10.1016/j.jfranklin.2014.12.018

(17) Balaji G Gawalwad and **Shambhu N Sharma**, On a non-linear electronic circuit filtering, *Circuits, Systems and Signal Processing* (CSSP) *Journal*, vol 35, issue 2, pp 459-480, February 2016. http://link.springer.com/article/10.1007/s00034-015-0070-0

(18) Ravish H Hirpara and **Shambhu N Sharma**, The Fokker-Planck equation for a stochastic single machine-infinite bus system, *Journal of Control Engineering and Applied Informatics* (an SCI Journal), vol 17, no 2, 55-63, 2015. http://www.ceai.srait.ro/index.php?journal=ceai&page=article&op=view&path[]=2820

(19) Sandhya Rathore and **Shambhu N Sharma**, Effect of switching uncertainty on a boost converter under a coloured noise influence, *International Journal of Dynamics and Control*, a Springer Journal, vol 5, Issue 2, pp 274–286, June 2017.

DOI: 10.1007/s40435-015-0192-z

(20) Ravish H Hirpara and **Shambhu N Sharma**, An analysis of a wind turbine-generator system in the presence of stochasticity and Fokker-Planck equations, *The ASME (The American Society of Mechanical Engineers) Transactions*, Journal of Computational and Non-linear Dynamics, submitted *revised* version.

(21) Ravish H Hirpara and **Shambhu N Sharma**, On the stochastic filtering theory of a power system dynamics, *Transactions of the Institute of Systems, Control and Information Engineers,* vol 29, no 1, 09-17, 2016. ***http://www.iscie.or.jp/e/?Transactions***

Book Chapters (all chapters are *solicited*)

Authoring statistics: two articles (single Authored), two (double authored)

(1) **Shambhu N. Sharma**

The Itô calculus for a noisy dynamical system, *Stochastic Control* (Chris Myers, Ed.), Sycio Science publisher, Vienna, Rizeka, August 2010, pp. 21-40.

(2) **Shambhu N. Sharma** and Hiren G Patel

The Fokker-Planck equation, *Stochastic Control* (Chris Myers, Ed.), Sycio Science publisher, Vienna, Rizeka, August 2010, pp. 1-20.

(3) **Shambhu N. Sharma**

Some appealing classical and stochastic evolution equations, *Evolution Equations* (Arthur L Cleys, Ed.), Nova Science publisher, Hauppauge, New York, May 2012, pp. 153-164.

(4) Nanasaheb S. Patil and **Shambhu N. Sharma**

Master equations in the theory of stochastic processes, *Evolution Equations* (Arthur L Cleys, Ed.), Nova Science publisher, Hauppauge, New York, May 2012, pp.419-432.

Selected refereed 'conference and symposium Papers' and extended abstract publication

Authoring statistics: one paper (single Authored), fifteen papers (double Authored)

(1) **Shambhu N Sharma** and Balaji G Gawalwad, Wiener meets Kolmogorov, *Norbert Wiener in the 21st Century* (Thinking Machines in the Physical World), 2016 IEEE (CSS) and IEEE (SSIT) IFAC Conference, , Jul 13-Jul 15, University of

Melbourne, Australia. http://ieeexplore.ieee.org/stamp/stamp.jsp?arnumber=7547457

(2) Ravish H Hirpara and **Shambhu N Sharma**, A hybrid non-linear filter for an Unmanned Aerial Vehicle (UAV) dynamics, *20th International Conference on System Theory, Control and Computing*, 13 - 15 October 2016, Sinaia, Romania**.**

(3) Ravish H Hirpara and **Shambhu N Sharma,** On a phase tracking problem: continuous-discrete filtering approaches, *the 27 th Chinese Control and Decision Conference (CCDC*), Haiqing Hotel, Quingdao, China, May 23-25, 2015.

(4) **Shambhu N Sharma,** A Kushner-Stratonovich stochastic method for non-linear dynamical systems, *IEEE Control Systems Society Kansai Chapter,* www.ieee-jp.org/section/kansai/chapter/css/pdfs/seminar-141104.pdf

(5) Ravish H Hirpara and **Shambhu N Sharma,** On the stochasticity of a machine swing equation using Itô differential, the Proceedings of the 46th ISCIE *(Institute of Transactions of Systems, Control and Information Engineers)* International Symposium on Stochastic Systems Theory and its Applications, Kyoto Institute of Technology, Japan, November 1-2, 2014, pp. 142-148.

(6) **Shambhu N. Sharma** and Ravish H. Hirpara, An underwater vehicle dynamics in the presence of noise and Fokker-Planck equations*, The 19th World Congress of International Federation of Automatic Control (IFAC),* Cape Town, South Africa, August 24-29, 2014.

(The IFAC Foundation extended a 1000 Euro support to one of the Authors for its presentation in the Congress.)

(7) Ravish H. Hirpara and **Shambhu N. Sharma,** On a wind turbine-generator system in the presence of wind speed noise and Fokker-Planck equations, *The Third International Conference on Advanced Control and Optimization in Dynamical Systems* (IFAC Papers On-Line database), Indian Institute of Technology, Kanpur, India, March 13-15, 2014.

(8) Nanasaheb S Patil and **Shambhu N Sharma**, On the theory of a time-varying bilinear Stratonovich stochastic differential system and its application to a dynamic circuit, *the 45th ISCIE (Institute of Transactions of Systems, Control and*

Information Engineers) International Symposium on Stochastic Systems Theory and its Applications, University of the Ryukyush, Okinawa, Japan, November 1-2, 2013.

(9) Balaji G Gawalwad and **Shambhu N Sharma**, On a perturbed phase-locked loop system: a simple physical model, the *2013 Multi-Conference on Systems and Control* : IEEE Control Systems Society Conference, Hyderabad, India, August 28, 2013.

(10) Ravish H Hirpara and **Shambhu N Sharma,** On a phase tracking problem: non-linear filtering approaches, *3rd International Conference on Systems and Control:* an IEEE Control Systems Society Conference, Algiers, Algeria, October 29-31, 2013.

(11) Sandhya Rathore and **Shambhu N Sharma** A non-linear switched system, the Lagrangian method and Itô theory, *The SICE (The Japanese Society of Instrumentation and Control Engineers) Annual Conference 2013,* Nagoya University, Nagoya, Japan, September 15, 2013.

(12) Sandhya Rathore and **Shambhu N Sharma** A Fokker-Planck model for a non-linear switched system, *3rd International Conference on Systems and Control,* an IEEE Control Systems Society Conference, Algiers, Algeria, October 29-31, 2013.

(13) Nanasaheb S Patil and **Shambhu N Sharma**, A note on a sampling mixer under the coloured noise influence, *the 2012 Multi-Conference on Systems and Control (MSC),* an IEEE Control Systems Society Conference, Dubrovnik Palace Hotel, Dubrovnik, Croatia, October 3, 2012.

(14) Balaji G Gawalwad and **Shambhu N Sharma**, Noise analysis of a CMOS inverter using Itô stochastic Differential Equation, *the 2012 Multi-Conference on Systems and Control (MSC),* an IEEE Control Systems Society Conference, Dubrovnik Palace Hotel, Dubrovnik, Croatia, October 3, 2012.

(15) Ravish H Hirpara and **Shambhu N Sharma,** An Ornstein-Uhlenbeck Process-Driven Power System Dynamics, *9th IFAC symposium on Control of Power and Energy Systems*, vol 48, issue 30, pp. 409–414, 2015.

(16) Nanasaheb S Patil and **Shambhu N Sharma**, A half-wave rectifier circuit as a bilinear stochastic differential system, *The Fourth International Conference on Advanced Control and Optimization in Dynamical Systems*, an IFAC Conference, National Institute of Technology, Trichy, India, February 1-5, 2016.

Research highlights

(1) The following paper published in the *Royal Society of London* considered for the *International press release,* chosen by the NASA/Smithsonian Astrophysical Observatory as its collection of papers as well as cited in prestigious Journals

(i) Shambhu N. Sharma and H. Parthasarathy

Dynamics of a stochastically perturbed two-body problem. *Pro. R. Soc. A,* The Royal Society: London, 463, pp.979-1003, 2007. (doi: 10.1080/rspa.2006.1801).

(2) A review of the paper, *International Journal of Control*, 79(9), pp. 1096-1106, 2006, added to the database of the Math Reviews, MR 224 2909(2007f: 93113) 93 E 11(60H 10) of *American Mathematical Society*.

PhD theses Supervised

(1) Dr. **Ravish H Hirpara** (D11EL002), Multi-dimensional systems in stochastic contexts, Electrical Engineering Department, NIT Surat, India, completed, November 22, 2016, *single supervision*

Thesis examiners: Professor Mrinal K Ghosh, Indian Institute of Science, Bangalore, India and Professor Jochim Peinke, School of Mathematics and Science, Institute of Physics, Uni Oldenburg-Universität Oldenburg, University, Germany.

(2) Dr. **Nanasaheb S. Patil** (D10EL704), Contributions to the theory of stochastic systems, Electrical Engineering Department, NIT Surat, India, *completed, August 1, 2015, single supervision*.

(*Thesis examiners*: Professor S N Merchant, Indian Institute of Technology, Mumbai, India and Professor Eric Rogers, Editor in-Chief, *International Journal of Control*, University of Southampton, United Kingdom).

(3) Dr. **Balaji Ganapatrao Gawalwad** (DS10EL704), Noise analysis of non-linear dynamic circuits using stochastic differential equations, Electrical Engineering Department, NIT Surat, Gujarat, India, *completed, September 4, 2015, single supervision*.

(*Thesis examiners*: Professor A N Jha, Indian Institute of Technology, Delhi, India and Professor Ian R Petersen, Editor, *Automatica, an IFAC Journal,* Australian Defence Force Academy, University of New South Welse, ADFA, Canberra).

(4) Dr. ***Hiren G. Patel*** (D09EL 702), Studies in randomly perturbed dynamical systems, Electrical Engineering Department, NIT Surat, India, *completed,* August 16, *2014, single supervision*.
(*Thesis examiners*: Professor S N Merchant, Indian Institute of Technology, Mumbai, India and Professor Yasumasa Fusisaki, then Associate Editor, *Automatica, an IFAC Journal*), Osaka University, Japan.

The work of the thesis of Dr. Hiren G Patel was described 'commendable' and recommended for 'the best PhD thesis award' by the Board of Examiners, which was constituted by the Senate Chairman of the Institute, August 16, 2014.
(5) Dr. Hardik Desai (D06EL702), Electrical Engineering Department, NIT Surat, India, *co-supervised, completed*, May 2013.

PhD theses' mentoring under progress
(1) Sandhya Rathore (D11EL 001), Electrical Engineering Department, NIT Surat, India, Embedding stochasticity into switched electrical networks, (Graduation expected in December 2017), *single supervision.*
(2) Deepali Dubey (DS15EL 003), Electrical Engineering Department, NIT Surat, India, Autonomous systems: control perspectives, (Graduation expected in December 2019), *co- supervising*.
(3) Shaival H Nagarseth (D16EL 002), Electrical Engineering Department, NIT Surat, India, *System-theoretic methods in mechanical systems and their control perspective* (Graduation expected in December 2020), *single supervision*.
(4) Shipra Kumari (D17EE 002), Electrical Engineering Department, NIT Surat, India, Non-linear switched electrical networks *The ubiquitous Riccati equation and its extensions to non-linear stochastic systems* (Graduation expected in December 2020), *co-supervising*.

M. Tech. Theses supervised* (Graduate Students) at NSIT Delhi
(1) Pragati Ahuja (Roll no. 11/PC/99, Enrolment DIT-31/99),
Software development for the parameter determination of semi-conductor devices, completion year March 2001, University of Delhi, Delhi.
(2) Vivek Sehgal (Roll no. 09/PC/00, Enrolment DIT-365/2000),

Design of reduced-order controllers for discrete systems using p-domain transformation, completion year Jan 2002, University of Delhi, Delhi

(3) Rajveer Singh (Roll no. 10/PC/99, Enrolment DIT-30/99),

Reduced-order models for discrete time systems, completion year 2002, University of Delhi, Delhi

(4) Vikram Choudhary (Roll no. 504/PC/2005, Enrolment DIT-463/05),

Stochastic estimation algorithms for a Duffing system, completion year July 2008, University of Delhi, Delhi

(5) Vishal Gupta (Roll no. 510/PC/2005, Enrolment DIT-467/2005)

On Volterra systems analysis, completion year May 2008, University of Delhi, Delhi

**Mode of Supervision: Single*

M. Tech. Theses supervised* (Graduate Students) at NIT Surat, India

(1) G. Venkateswarlu (Roll no.P08EL853), Analysis and design of Buck-boost converter, Electrical Engineering Department, NIT Surat, Gujarat, India, July 2011.

(2) Mihir C Rathod (Roll no. P09EL869), Design and development of a transformer less inverter using buck and boost inverter, Electrical Engineering Department, NIT Surat, July 2011.

(3) B Ram Chandra Rao (Roll no. P 10EL 878), A multi switch buck-boost converter for photovoltaic DC-DC applications, Electrical Engineering Department, NIT Surat, July 2012.

(4) Mayank S Bhatt (P10EL 888), System-theoretic analysis of buck converter, Electrical Engineering Department, NIT Surat, July 2012.

(5) Ashok Thammadi (P11EL017), Multi-input integrated buck-boost converter for photovoltaic applications, Electrical Engineering Department, NIT Surat, July 2013.

(6) Krishna Deo Paswan (P12EL017), Stability analysis of DC-DC converters, Electrical Engineering Department, NIT Surat, July 2014.

(7) Ambati Bhimaraju (P12PS014), Stability analysis of Power Systems, Electrical Engineering Department, NIT Surat, July 2014.

(8) T. Santosh Kumar, (P13EL011), Dynamic modeling of Cuk conveter circuits, Electrical Engineering Department, NIT Surat, July 2015.

(9) Naresh Kumar Jaisawal, (P13PS014), On a power system dynamics problem, Electrical Engineering Department, NIT Surat, July 2015.

(10) Anand Kumar Dubey, (P14EL005), Voltage control of DC-DC converter using fractional PID controller, Electrical Engineering Department, NIT Surat, July 2016.
(11) Shani Kumar Pandey, (P14PS001), Lyapunov stability criterion for linear and non-linear power system models, Electrical Engineering Department, NIT Surat, July 2016.

B. Tech. Theses supervised

In addition to PhD and M. Tech. Theses supervisions, advised around 20 (*thirty*) groups of B. Tech. student theses at NSIT Delhi as well as NIT Surat, Gujarat, India. Each group has optimally five students.

Research Projects

(i) Shambhu N Sharma (Principal Investigator), Development of stochastic filtering algorithms for coloured noise processes: control-theoretic perspective, CSIR research grant scheme, Engineering Sciences, New Delhi, CSIR, No. 22(0679)/14/EMR-II, date of commencement, January 1, 2015, completion date, December 31, 2016, two-year duration.

Outcomes: The CSIR is credited to the following publications:

1. Balaji G Gawalwad and **Shambhu N Sharma**, On a non-linear electronic circuit filtering, *Circuits, Systems and Signal Processing* (CSSP) *Journal*, vol 35, issue 2, pp 459-480, February 2016. http://link.springer.com/article/10.1007/s00034-015-0070-0

2. **Shambhu N Sharma** and Balaji G Gawalwad, Wiener meets Kolmogorov, *Norbert Wiener in the 21st Century* (Thinking Machines in the Physical World), 2016 IEEE (CSS) and IEEE (SSIT) IFAC Conference, , Jul 13-Jul 15, University of Melbourne, Australia. http://ieeexplore.ieee.org/stamp/stamp.jsp?arnumber=7547457

MHRD Pedagogy project

(1) Shambhu N Sharma (Principal Developer) , Probability Theory and Stochastic Processes , National Mission Project on Education through ICT under the aegis of IIT

Khargpur, Sponsored by Ministry of Human Resource Development (MHRD), Govt. of India, *Course released.*

Intended Audience: Core Course, seventh semester, Electronics and Communication Engineering

(With Dr. Satish Chand **(Co-Developer),** Professor, Department of Computing and Information Sciences, Jawaharlal Nehru University, New Delhi, India) http://www.ide.iitkgp.ernet.in/Pedagogy1/course_details.jsp?EMAIL_ID=sns%40eed.svnit.ac.in&PASSWORD=probability&USER_ID=88&LOGIN=null&PASSWORD_ID=null&COURSE_NAME=Probability+Theory+and+Stochastic+Processes

---

Citations

(1) **S. N. Sharma**, H. Parthasarathy and J.R.P. Gupta, Third-order approximate Kushner filter for a non-linear dynamical system, *International Journal of Control*, 79(9), pp. 1096-1106, 2006. (doi: 10.1080/00207170600800124).

Citation history

(i) S. Tronci, A. Balzano, J. Alvarez, R. Baratti, Global-nonlinear stochastic estimation of exothermic reactors with temperature measurement, *Proceedings of the 9th International Symposium on Dynamics and Control of Process Systems, DYCOPS 2010* (Mayuresh Kothare, Moses Tade, Alain Vande Wouwer, Ilse Smets, Eds.), Leuven, Belgium, July 5-7, 2010. http://www.nt.ntnu.no/users/skoge/prost/proceedings/dycops-2010/Papers_DYCOPS2010/WeET1-03.pdf

(ii) M. Mossberg, E. Mossberg**,** A note on parameter estimation in Lamperti transformed fractional Ornstein-Uhlenbeck processes, *16th IFAC Symposium on System Identification*, Square- Brussels Meeting Centre, Belgium, 2012.

(iii) Shambhu N. Sharma and H. Parthasarathy, Dynamics of a stochastically perturbed two-body problem, *Pro. R. Soc. A,* The Royal Society: London, 463, pp.979-1003, 2007.

---

(2) **Shambhu N. Sharma** and H. Parthasarathy, Dynamics of a stochastically perturbed two-body problem. *Pro. R. Soc. A,* The Royal Society: London, 463, pp.979-1003, 2007. (doi: 10.1080/rspa.2006.1801).

Citation history

(i) J. Cresson, F. Pierret and B. Puig, The Sharma-Parthasarathy stochastic two-body problem, *Journal of Mathematical Physics (An AIP Journal)*, 56, 032701 (2015). http://dx.doi.org/10.1063/1.4906908

(ii) Yifei Sun, and Mrinal Kumar, Uncertainty forecasting in the perturbed two-body problem via tensor decomposition, 016 *American Control Conference* (ACC), Boston Marriott Copley Place July 6-8, 2016. Boston, MA, USA.

(iii) F. Pierret, Perturbations stochastiques en Astronomie, Observatoire de Paris, http://smai.emath.fr/smai2015/resumesPDF/pierret/Abstract.pdf

(iv) Creeson Jacky, The stochastisation hypothesis and the spacing of planetary systems, *Journal of Mathematical Physics (An AIP Journal)*, vol 52, issue 11, pp. 113502-113502-20 (2011).

(v) J. Cresson, F. Pierret and B. Puig, The Sharma-Parthasarathy stochastic two-body problem, arXiv:1402.1752.

(vi) J. Cresson, F. Pierret and B. Puig, Stochastic perturbation of the two-body problem, Société Francaise d'Astronomie et d'Astrophysique (SF2A), (L. Cambrésy, F. Martins, E. Nuss and A. Palacios eds), France, 195-203, 2013.
http://sf2a.eu/semaine-sf2a/2013/proceedings/2013sf2a.conf..0195P.pdf

(vii) F. A. Abd El-Salam, S. E. Abd El-Bar, M. Rasem and S. Z. Alamiri, New formulation of the two-body problem using a continued fractional potential, *Astrophysics and Space Science*, an Springer Journal, 350 (2), pp. 507-515, April 2014.
http://link.springer.com/article/10.1007/s10509-014-1800-7

(viii) Frédéric Pierret, Stochastic Gauss Equations, http://arxiv.org/abs/1402.1758

(ix) Jacky Cresson, Frédéric Pierret and Bénédicte Puig, Stochastic perturbation of the two-body problem.
arXiv:1402.1752

(x) Rawat, T. K., Parthasarathy, H, Manoeuvring target tracking with coordinated-turn motion using stochastic non-linear filter, *International Journal of Control,* 81, 7, July 2008 , pp. 1102-1113.

(xi) Shambhu N. Sharma, A Kolmogorov-Fokker-Planck approach for a stochastic Duffing-van der Pol system, *Differential Equations and Dynamical Systems:* Mathematics and Statistics, 16(4), pp. 351-377, October, 2008.

(xii) Sandhya Rathore and **Shambhu N Sharma**, Effect of switching uncertainty on a boost converter under a coloured noise influence, *International Journal of Dynamics and Control*, a Springer Journal, DOI: 10.1007/s40435-015-0192-z

(xiii) Yifei Sun, Mrinal Kumar, Uncertainty propagation in orbital mechanics via tensor decomposition, *Celestial Mechanics and Dynamical Astronomy*, http://link.springer.com/article/10.1007/s10569-015-9662-z/fulltext.html

(xiv) Elbaz. I. Abouelmagd, S. M Elshaboury, H. H. Selim, Numerical integration of a relativistic two-body problem via a multiple scales method, http://arxiv.org/abs/1512.03496

(xv) Frédéric Pierret, Modélisation de systèmes dynamiques déterministes, stochastiques ou discrets Application à l'Astronomie et la Physique, Thèse de octorat de l'Observatoire de Paris, Spécialité : Mathématiques, École Doctorale d'Astronomie et d'Astrophysique d'Ile-de-France, 12 octobre 2015.

---

(3) **Shambhu N. Sharma**, and H. Parthasarathy

A two-body continuous-discrete filter, *Non-linear Dynamics* (An international Journal for dynamics and control), Springer: the Netherlands, 51(nos. 1-2), 155-170, 2008 (doi: 10.1007/s11071-007-9199-0).

Citation history

(i) M. Majji, John L. Junkins and James D. Turner, A perturbation method for estimation of dynamic systems, *Nonlinear Dynamics* (An international Journal for dynamics and control), Springer: the Netherlands, 60, 3, 303-325, DOI: 10.1007/s11071-009-9597-6.

(ii) Rawat, T. K., Parthasarathy, H., Satellite tracking using a second-order stochastic nonlinear filter, *HAIT Journal of Science and Engineering*, http://www.magniel.com/jse/B/inpress/rawat.pdf

(iii) Shambhu N. Sharma, Non-linear filtering for a dust-perturbed two-body model, *Non-linear Dynamics* (An international Journal for dynamics and control), Springer: the Netherlands, 55, pp.221-238, 2009.

---

(4) **Shambhu N. Sharma**, Non-linear filtering for a dust-perturbed two-body model, *Non-linear Dynamics* (An international Journal for dynamics and control), Springer: the Netherlands, 55, pp.221-238, 2009.

Citation history

(i) Yifei Sun, and Mrinal Kumar, Uncertainty forecasting in the perturbed two-body problem via tensor decomposition, 016 *American Control Conference* (ACC), Boston Marriott Copley Place July 6-8, 2016. Boston, MA, USA.

(ii) M. Majji, John L. Junkins and James D. Turner, A perturbation method for estimation of dynamic systems, *Nonlinear Dynamics* (An international Journal for dynamics and control), Springer: the Netherlands, 60, 3, 303-325, DOI: 10.1007/s11071-009-9597-6.

(iii) Yifei Sun, Mrinal Kumar, Uncertainty propagation in orbital mechanics via tensor decomposition, *Celestial Mechanics and Dynamical Astronomy*, http://link.springer.com/article/10.1007/s10569-015-9662-z/fulltext.html

(iv) Yang Meng, Shesheng Gao, Yongmin Zhong, Gaoge Hu, Aleksandar Subic, Covariance matching based adaptive unscented Kalman filter for direct filtering in INS/GNSS integration, *Acta Astronautica*, http://www.sciencedirect.com/science/article/pii/S0094576515004592

---

(5) **Shambhu N. Sharma**, A Kushner approach for small random perturbations of a stochastic Duffing-van der Pol system, *Automatica* (a Journal of IFAC, International Federation of Automatic Control), 45, pp. 1097-1099, 2009.

Citation history

(i) Barnes, A., Balda, J., and Escobar-Mejia, A., A Semi-Markov Model for Control of Energy Storage in Utility Grids and Microgrids with PV Generation, *IEEE Transactions on Sustainable Energy,* vol. 99, 2015.

http://ieeexplore.ieee.org/xpls/abs_all.jsp?arnumber=7045576

(ii) S. Tronci, A. Balzano, J. Alvarez, R. Baratti, Global-nonlinear stochastic estimation of exothermic reactors with temperature measurement, *Proceedings of the 9th International Symposium on Dynamics and Control of Process Systems, DYCOPS 2010* (Mayuresh Kothare, Moses Tade, Alain Vande Wouwer, Ilse Smets, Eds.), Leuven, Belgium, July 5-7, 2010. http://www.nt.ntnu.no/users/skoge/prost/proceedings/dycops-2010/Papers_DYCOPS2010/WeET1-03.pdf

(iii) Victor Lee, Jangho Yoon, Prakash Vedula, Nonlinear filtering and Bayesian multi-sensor fusion using adaptive quadrature, *AIAA Guidance, Navigation and Control Conference*, 08-11 August, 2011, Portland, Orgean.

(iv) AK Barnes, JC Balda, JK Hayes, Modelling PV Clouding Effects Using a Semi-Markov Process with Application to Energy Storage, *the 19th World Congress, the International Federation of Automatic Control*, Cape Town, South Africa. August 24-29, 2014.

---

(6) **Shambhu N. Sharma**, A Kolmogorov-Fokker-Planck approach for a stochastic Duffing-van der Pol system, *Differential Equations and Dynamical Systems:* Mathematics and Statistics, 16(4), pp. 351-377, October, 2008.

Citation history

(i) Yang, Hongfu, Qimin Zhang, and Juanting Feng. "Numerical Simulations Based on POD for Stochastic Age-Dependent System of Two Species." *Differential equations and Dynamical Systems* (2014): 1-19.

(ii) Nanasaheb S Patel and Shambhu N. Sharma**,**

On a non-linear stochastic dynamic circuit using Stratonovich differential, *Journal of the Franklin Institute*. doi:10.1016/j.jfranklin.2014.12.018

(iii) Salam Nema, Piotr Kowalczyk, Detecting Abrupt Changes in a Noisy van der Pol Type Oscillator, *Differential Equations and Dynamical Systems*, June, 2015.

DOI 10.1007/s12591-015-0252-z

---

(7) Hiren G Patel and **Shambhu N. Sharma, "**Third-order continuous-discrete filtering equations for a non-linear dynamical system," *The ASME(The American Society of Mechanical Engineers) Transactions*, Journal of Computational and Non-linear Dynamics, 9(3), 034502-9, July 2014. doi:10.1115/1.4026064.

Citation history

(i) Jarvis Schultz, Kathrin Flaßkamp and Todd D. Murphey, Variational integrators for structure-preserving filtering, *The ASME(The American Society of Mechanical Engineers) Transactions*, *Journal of Computational and Nonlinear Dynamics,*[*http://computationalnonlinear.asmedigitalcollection.asme.org/article.aspx?articleid=2554125*](http://computationalnonlinear.asmedigitalcollection.asme.org/article.aspx?articleid=2554125)

(ii) Ruixiang Zheng, Mian Li, Zhaoguang Wang and Qiang Zhang, Control of Blow-Down Wind Tunnel Using Combined Extended and Nonlinear Predictive Filters, *ASME Turbo Expo 2015: Turbine Technical Conference and Exposition*, Montreal, Quebec, Canada, June 15–19, 2015.

(iii) Ravish H Hirpara and **Shambhu N Sharma**, The Fokker-Planck equation for a stochastic single machine-infinite bus system, *Journal of Control Engineering and Applied Informatics* (an SCI Journal), vol 17, no 2, 55-63, 2015.

---

(8) Balaji G Gawalwad and **Shambhu N Sharma**, On a perturbed phase-locked loop system: a simple physical model, the *2013 Multi-Conference on Systems and Control*: IEEE Control Systems Society Conference, Hyderabad, India, August 28, 2013.

Citation history

RJA Baker, B Leung, C Nielsen, Phase-locked loop stability based on stochastic bounds, *Analog Integrated Circuits and Signal Processing, August* 2015, **http://link.springer.com/article/10.1007/s10470-015-0606-z**

---

(9) **Shambhu N. Sharma** and Hiren G Patel, The Fokker-Planck equation, *Stochastic Control* (Chris Myers, Ed.), Sycio Science publisher, Vienna, Rizeka, August 2010, pp. 1-20.

***Usages*:** 15000 downloads yet since its publication in August 2010 (*highest accessed chapter of the book and impressive readership*)

Citation history

V Yu Zitserman, A M Berezhkovskii, A E Antipov, Yu A Makhnovskii, Communication: Drift velocity of Brownian particle in a periodically tapered tube induced by a time-periodic force with zero mean: Dependence on the force period, *The Journal of Chemical Physics*, **135(12),** 121102**, 09/2011.**

Péter Dusán Ispánovity, István Groma, Wolfgang Hoffelner, Maria Samaras, Abnormal subgrain growth in a dislocation-based model of recovery, *Modelling and Simulation in Materials Science and Engineering*, 19(4), 10/2010.

Martha Anne Gallivan, Modeling and Control of Epitaxial Thin Film Growth, http://www.researchgate.net/publication/41482110_Modeling_and_Control_of_Epitaxial_Thin_Film_Growth

Yuri P Kalmykov, Matrix method calculation of the Kerr effect transient and ac stationary responses of arbitrary shaped macromolecules *The Journal of Chemical Physics*, 131(7), 07410709/2009, DOI: 10.1063/1.3200942.

---

(11) **Shambhu N. Sharma**, The Itô calculus for a noisy dynamical system, *Stochastic Control* (Chris Myers, Ed.), Sycio Science publisher, Vienna, Rizeka, August 2010, pp. 21-40.

***Usages*:** 7000 downloads yet since its publication in August 2010.

---

(12) Nanasaheb S. Patil, Balaji G Gawalwad, **Shambhu N Sharma,**

A random-input driven resistive-capacitive circuit, *International Confererence on Recent Advances in Electrical, Electronics and Control Engineering,* an IEEE Conference, Sivakasi, Tamilnadu, December 15, 2011.

Citation history

(i) E. Kolarova, L. Brancik, Vector linear stochastic differential equations and their applications to electrical networks, *35th International Conference on Telecommunications and Signal Processing (TSP), 2012*, http://ieeexplore.ieee.org/xpls/abs_all.jsp?arnumber=6256305

(ii) L. Brancik, E. Kolarova, Stochastic differential equations approach in the analysis of MTLs with randomly varied parameters, *19th IEEE International Conference on* Electronics, Circuits and Systems (ICECS)
http://ieeexplore.ieee.org/xpl/mostRecentIssue.jsp?punumber=6450169

(iii) E Kolářová, L Brančík, Vector stochastic differential equations used to electrical networks with random parameters, *International Journal of Advances in communications, Electrotechnics, signals and systems*, **http://ijates.org/index.php/ijates/article/view/24**

(iv) L Brancik, A Prokes, E Kolarova, Simulation of random effects in transmission line models via stochastic differential equations, *2nd International Conference on Advances in Computational Tools for Engineering Applications (ACTEA)*, 2012.
http://ieeexplore.ieee.org/xpl/mostRecentIssue.jsp?punumber=6454263

---

(13) Nanasaheb S Patil and **Shambhu N Sharma**, A prediction theory for a coloured noise-driven stochastic differential system, *System Sciences and Control Engineering* (a Taylor and Francis Journal), 2 (1), 342-350, 2014.

Citation history

(i) W Zhou, Y Tan, Y Liu, Protein Secondary Structure Prediction Based on Parallel Particle Swarm Optimization Algorithm, *Differential Equations and Dynamical Systems.*

(ii) Siu-Siu Guo and Qingxuan Shi, Stationary Solution of Duffing Oscillator driven by Additive and Multiplicative Colored Noise Excitations, ASME Transactions, *Journal of Vibration and Acoustics*, ASME Transactions, doi:10.1115/1.4035308.

Outreach activities co-ordinated

'self-financed'

(1) A week short term course on '*Recent Trends in Control and Instrumentatio*n' Electrical Engineering Department, NIT Surat, India, January 28- February1, 2013.

(*Role: Main Teacher and Co-ordinator*)

(2) A week short term course on '*Advances in Control and Instrumentation Education*', Electrical Engineering Department, NIT Surat, India, February 24-28, 2014.

(*Role: Main Teacher and Co-ordinator*)

AICTE-QIP Short Term Courses

(i) A week short term course on *Advances in Control and Instrumentation Education and their Implementation*, NIT Surat, India, **December 12-16, 2016.**

(*Role: One of the Teachers and Co-ordinator*)

***TEQIP II'-Sponsored'* courses**

(1) A week short term course on '*Power electronic circuits and control*', Electrical Engineering Department, NIT Surat, India, December 14-18, 2015.

(Role: One of the Co-ordinators and one of the Teachers).

(2) A week short term course on '*Power filter technology and control*', Electrical Engineering Department, NIT Surat, India, June 2-6, 2014.

(Role: One of the Co-ordinators and one of the Teachers).

(3) A week short term course on '*Power electronic systems and control*' Electrical Engineering Department, NIT Surat, India, scheduled, December 8-12, 2014.
(*Role:* One of the Co-ordinators and One of the Teachers)
(4) A week short term course on '*Advances in control and instrumentation education*', Electrical Engineering Department, NIT Surat, India, May 18-22, 2015.
(*Role:* One of the Co-ordinators and one of the Teachers)

Invited talks co-ordinated

(i) An invited talk on 'Path planning and minimum time grabbing of tumbling satellites' by *Professor Issac Kurien*, Indian Institute of Space Sciences and Technology, July 7, 2016, at Electrical Engineering Department, SV National Institute of Technology, Surat, India.
(Role: The Co-ordinator)
(ii) An invited talk on 'Option pricing and Credit risk' by *Professor M K Ghosh*, Indian Institute of Science, Bangalore, November 22, 2016, at Electrical Engineering Department, SV National Institute of Technology, Surat, India.
(Role: The Co-ordinator)

Finishing schools organized intended for popularizing control educations among under graduate students

(1) A Finishing school on 'Industrial Automations', Electrical Engineering Department, NIT Surat, India, September 25-26, and October 3-4, 2015.
(2) A Finishing school on 'Recent trends in Industrial Automations', Electrical Engineering Department, NIT Surat, India, September 6-7, and 13-14, 2014.
(Role: One of the Co-ordinators and one of the Teachers).
(3) A Finishing school on 'Recent trends in industrial automations, Electrical Engineering Department, NIT Surat, India, October 4-5, and 11-12, 2014.
(Role: One of the Co-ordinators and one of the Teachers).
(4) A Finishing school on 'Industrial Automations', Electrical Engineering Department, NIT Surat, India, April 2-5, 2015.
(Role: One of the Co-ordinators and one of the Teachers).
(5) A Finishing school on '*Industrial Automations'*, Electrical Engineering Department, NIT Surat, India, June 20-24, 2016.

(Role: One of the Co-ordinators and one of the Teachers).

(6) A Finishing school on '*Industrial Automations'*, Electrical Engineering Department, NIT Surat, India, July 28-29, 2017.

(Role: One of the Co-ordinators and one of the Teachers).

Other outreach activities, Course material design, lab development, participation, organising the science events

(1) Expert Member, selection committee, *Robotics*, Japanese Fellowship Program (PhD and M Tech program), Ministry of Human Resource Development, New Delhi, June 2014.

(2) Participated via *invitation* in an inaugural event, a workshop on 'New directions in applied mathematics', *International Centre for Theoretical Science of TIFR Mumbai (India),* Jan. 1-3, 2010, Bangalore, India.

(3) Participated in MHRD's National Mission for Teachers, *Management Capacity Enhancement Programme,* Indian Institute of Management, Indore, January 16-25, 2013.

(4) Participated in *National Policy Dialogue* on World University Ranking, Research Evaluations, Research Funding and participated in the group discussions on '*Research Evaluations'* organized by Ministry of Human Resource Development and Planning Commision, May 23, 2013, New Delhi, India.

(5) Participated in a workshop on Project Management Education in NITs, March 21, 2014, Chennai Jointly Organised with NIT Warangal, Project Management Institute, Bangalore and L &T Chennai.

(6) Upgraded control engineering laboratory, Electrical Engineering Department, National Institute of Technology, Surat, India

(7) Designed an M. Tech. course structure of the subject, *Fundamentals of System Theory (code EL 607),* adopted by the Electrical Engineering Department of NIT Surat, July 2009, and taught the course as a *single* Instructor.

(8) Designed an M. Tech. course structure of the subject, *Linear algebra: its applications and related topics,* for the power systems specialization under Electrical Engineering Department, NIT Surat, Gujarat, India, July 2011.

Scholarships and Research grants received

(1) Selected for the Rural National Talent Search Examination

(2) Graduate Aptitude Test in Engineering (GATE) Scholarship

(3) International Travel Support (ITS) of the Department of Science and Technology, Government of India for the participation in the 19 th International Federation of Automatic Control(IFAC) World Congress, Cape Town, South Africa, August 2014.

Contributions to Academic Administrations of SV NIT Surat, India

(1) *Associate Dean, Academic,* National Institute of Technology, Surat, India, from April 2012 till April 2014

(2) Invitee *Member, the Senate*, SVNIT, April 2012 till April 2014

(3) *Member, Institute Space Planning and Allocation Committee,* SV NIT, August 13, 2015.

(4) *Member, IAAC* (Institute Academic Advisory Committee), SV NIT, April, 2012 till April, 2014.

(5) Coordinated *the NBA* (National Board of Accreditation) activities for the UG and PG program proposals, 2012- May 2013.

(6) *Founder Centre in-Charge*, *CCMT 2012,* SV National Institute of Technology, the Centralized Counseling for MTech and M Plan Programmes of the NITs, June 2012.

(7) *Chairman*, PG Admissions, National Institute of Technolgy, Surat, India, February 2012 till August 5, 2012.

(8) *The Co-ordinator, B Tech first year*, SV National Institute of Technology, July 2012 till December 2013.

(9) *Member Secretary*, the Institute School Committee, National Institute of Technology, Surat, India, February 2012 till date

(10) *Chairman*, Centre for Human Resource Development (CHRD), NIT Surat, India, June 2009 till May 2010.

(11) *Member*, the Electrical Engineering Department representative, the Institute Library committee, NIT Surat, June 10, 2011 till date.

(12) *Lab-in-charge*, Control lab, Department of Electrical Engineering, National Institute of Technology, Surat, India.

(13) *Member*, Departmental Research Committee, Electrical Engineering Department, NIT Surat, India, July 2009 till date

(14) *Member*, a purchase committee for Central Computer Centre, NIT Surat, India, December 2009 till date

PhD, M Tech and other research-related committees

(1) The external Thesis examiner of *four* M Tech students (Control Systems) of the National Institute of Technology, Kurukshetra, August 26, 2015.

(2) Acted as the *Chairman, Board of Examiners* for viva examinations of PhD theses of different Departments of National Institute of Technology (Mechanical Engineering, Applied Mechanics, and Applied Chemistry Departments) Surat, India, 2012-2013.

(3) Director Nominee for the PhD admission in *dynamics group* of Mechanical Engineering Department, NIT Surat, India, July 12, 2011.

(12) Member, Departmental Research Committee, Electrical Engineering

Department-Institute level assignments at NSIT Delhi

(1) Lab-in-charge of Principle of Electrical Engineering Lab (NSIT Delhi) till Dec. 2006.

(2) Lab-in-charge of Control Engineering Lab (NSIT Delhi) till March 2009.

(3) Co-ordinator, practical examination, NSIT Delhi, for one year.

(4) Member, postgraduate committee of the ICE Division (NSIT Delhi) till March 2009.

(5) Member, selection committee for the M. Tech. Admission in Computer Engineering Division (NSIT Delhi), 2002.

(6) Member, selection committee for the M. Tech. Admission in Electronics and Communication Engineering Division (NSIT Delhi), 2003.

(7) Member, selection committee for the M. Tech. Admission in Electronics and Communication Engineering Division (NSIT Delhi), 2006.

University of Delhi and Government of Delhi assignments

(1) Member, Departmental Research Council (DRC), Instrumentation and Control Engineering, *University of Delhi*, Delhi, India till March 2009.

(2) Member, courses' committee of Instrumentation and Control Engineering Division, the Faculty of Technology (FoT), the *University of Delhi*, Delhi till March 2009.

(3) A Faculty representative of Deptt. of Training and Technical Education (DTTE), the *Govt of Delhi*, India, for the Electronic meter testing drives (October 2005).

Declaration: The contents of the CV are completely true to the best of knowledge of the undersigned. Date April 30, 2017.

Dr. S N Sharma