Curriculum Vitae

Dr. Sushil Kumar

Assistant Professor

Applied Mathematics & Humanities Department,

S. V. National Institute of Technology Surat, Gujarat-India-395007

Email: sushilk@amhd.svnit.ac.in, skumar.iitr@gmail.com

Contcat No.: +912612201761 (O); +917228009980 (M)

Field of Interest

Mathematical Modeling and Simulation, Biomechanics, Moving Boundary Problems, Heat Transfer, Fractional Differential equations, Numerical Solution, Radial Basis Functions, Chebyshev Polynomials.

Recent Work

Mathematical modelling and simulation of partial and fractional differential equations arising in the modelling of heat transfer process in biological system using Chebyshev polynomials and Radial basis functions.

Sponsored Research Projects

Ongoing:

> *Title:* Computational study on multi-dimensional Stefan problems in biological tissues based on non-Fourier heat transfer model using mesh-free method
>
> *Amount:* Rs. 16,20,518.00   *Duration:* Jun 2018-Continued
>
> *Funded by:* Science and Engineering Research Board (SERB), DST, Govt. of India, New Delhi

Completed:

> *Title:* Mathematical modeling and solution of Stefan problem in biological tissues using non-Fourier heat transfer.
>
> *Amount:* Rs. 5,80,000.00   *Duration:* Jun 2014-May 2016
>
> *Funded by:* S. V. National Institute of Technology Surat, Gujarat, India

Selected Publications

International Journals

1. Numerical study on thermal therapy of triple layer skin tissue using fractional bioheat model, International Journal of Biomathematics, Vol. 11, No. 4 (2018) 1850052 (24 pages) (with R. S. Damor and A. K. Shukla)

2. Fourth kind shifted Chebyshev polynomials for solving space fractional order advection dispersion equation based on collocation method and finite difference approximation, International Journal of Applied and Computational Mathematics, Vol 4:82 (2018).

3. Second kind Chebyshev polynomials for solving space fractional advection - dispersion equation using collocation method, Iranian Journal of Science and Technology, Transactions A: Science, Online first on 30 Jan 2018, https://doi.org/10.1007/s40995-018-0480-5 (with Vijay Saw)

4. Dual phase lag bio-heat transfer during cryosurgery of lung cancer: comparison of three heat transfer models, Journal of Thermal Biology, Volume 69, October 2017, pp 228237. (with Ajay Kumar, Prof. V. K. Katiyar and Shirley Telles)

5. Phase change heat transfer during cryosurgery of lung cancer using hyperbolic heat conduction model, Computer in Biology and Medicine, Volume 84, 1 May 2107, pp 20-29 (with Ajay Kumar, Prof. V. K. Katiyar and Shirley Telles)

6. Fuzzy similarity measure based spectral slustering framework for noisy image segmentation, International Journal of Uncertainty, Fuzziness and Knowledge-Based Systems, Vol. 25, No. 4 (2017) 649673 (with Subhanshu Goyal, M. A. Zaveri, A. K. Shukla)

7. Solution of fractional bioheat equation in terms of Foxs H-function, Springer Plus (2016) 5:111 (with R. S. Damor and A. K. Shukla)

8. Numerical analysis of triple layer skin tissue freezing using non-Fourier heat conduction, Journal of Mechanics in Medicine and Biology, Volume 16, Issue 02, March 2016. (with Sonalika Singh)

9. Freezing of biological tissues during cryosurgery using hyperbolic heat conduction model, Mathematical Modelling and Analysis, Vol 20 (4), 2015, pp 443-456. (with Sonalika Singh)

10. A Survey on graph partitioning approach to spectral clustering, Journal of Computer Science & Cybernetics, Vol 20, Issue 4, (2015), 443-456 (with Subhanshu Goyal, M. A. Zaveri, A. K. Shukla)

11. Numerical study on triple layer skin tissue freezing using dual phase lag bio heat model, International Journal of Thermal Science, Vol 86, 2014, pp 12-20. (with Sonalika Singh)

12. A study on the effect of metabolic heat generation on biological tissue freezing, The Scientific World Journal, Article ID 398386, 2013, 7 pages. (with Sonalika Singh)

13. Numerical simulation of fractional bio heat equation in hyperthermia treatment, Journal of Mechanics in Medicine and Biology, Vol 14, No. 2 (2014), World Scientific Publication. (with Ramesh S Damor and A K Shukla)

14. Numerical solution of fractional diffusion equation model for freezing in finite media, International Journal of Engineering Mathematics, 2013 (Article ID 785609), 8 pages (with Ramesh S Damor and A K Shukla)

15. Numerical solution of fractional bioheat equation with constant and sinusoidal heat flux condition on skin tissue, American Journal of Mathematical Analysis Vol 1, No. 2 (2013): 20-24. (with Ramesh S Damor and A K Shukla)

16. Mathematical modeling of freezing and thawing process in tissues: a porous media approach, International Journal of Applied Mechanics, Vol. 2, No. 3 (2010) pp 617633 (with V. K. Katiyar)

17. Numerical modeling of pulsatile flow of blood through a stenosed tapered artery under periodic body acceleration, Journal of Mechanics in Medicine and Biology, Vol. 10, No. 2 (2010) pp 251272. (with G. Varshney and V. K. Katiyar)

18. Effect of magnetic field on the blood flow in artery having multiple stenosis: a numerical study, International Journal of Engineering, Science and Technology, Vol. 2, No. 2 (2010), pp. 67-82 (with Prof. V. K. Katiyar and Gaurav Varshney)

19. Numerical study on phase change heat transfer during combined hyperthermia and cryosurgical treatment of lung cancer, International Journal of Applied Mathematics and Mechanics Vol 3, Issue 3, (2007) pp 1-17, (with Prof. V. K. Katiyar)

20. Mathematical modeling and numerical simulation of drug release in stented artery, International Journal of Applied Mathematics and Mechanics, Vol 4, Issue 1, (2008) pp 91-102. (with G. Varshney and V. K. Katiyar)

International Proceedings

1. Temperature distribution in living tissue with fractional bio-heat model in thermal therapy, Proceedings of International Conference on Advances in Tribology and Engineering Systems, Springer India, 2014, pp 493-498 (with Ramesh S Damor and A K Shukla)

2. Mathematical modeling of thawing problem in skin and subcutaneous Tissue, in C.T. Lim and J.C.H. Goh (Eds.): WCB 2010, IFMBE Proceedings 31, (2010) pp. 16111614, (with V. K. Katiyar)

3. Numerical simulation of thawing process of biological tissues as porous media during cryosurgery, presented in 5th world congress on Biomechanics, Munich (Germany) from July, 29 to Aug 4, 2006. Abstract in: Journal of Biomechanics Vol-39 Supp 1(2006) pp S384 (with Prof. V. K. Katiyar)

Book Chapters

1. Numerical study on biological tissue freezing using dual phase lag bio-heat equation, In Mondaini R. (eds) Trends in Biomathematics: Modeling, Optimization and Computational Problems. Springer, pp. 283-300 (2018) (with Dr. Sonalika Singh)

2. The approximate solution for multi-term the fractional order initial value problem using collocation method based on shifted Chebyshev polynomials of the first kind, In: Chandra P., Giri D., Li F., Kar S., Jana D. (eds) Information Technology and Applied Mathematics. Advances in Intelligent Systems and Computing, vol 699. Springer, (2018) (with Mr. Vijay Saw)

Conference Presentation

1. "Study on biological tissue freezing using dual phase lag bio-heat equation" in 17th International Symposium Mathematical Biology/Biological Physics (BIOMAT 2017) at Institute of Numerical Mathematics Russian Academy of Sciences, Moscow, Russian Federation, October 30 November 03, 2017

2. "Study on moving boundary problem during convective freezing with energy generation" in the spring 2012 Eastern Sectional Meeting of the American Mathematical Society (AMS), George Washington University in Washington, DC, USA, during March 17-18, 2012.

3. "Mathematical modeling of phase change process in tissues using porous media approach", 76th Annual Conferece of Indian Mathematical Society held in SVNIT Surat during Dec 26-29-2010.

4. "A parametric study on phase change heat transfer process during cryosurgery of lung tumor". National Conference on Biomechanics at IIT Roorke, during March 07-08, 2009

5. "Mathematical modeling of freezing process during cryosurgery in tissues considered as porous media", Advances in Mathematics and its Application (AMA-08), held at NIT Hamirpur (H.P.) during Dec 19-21, 2008. (Proc: Advances in Mathematics and its Application (AMA-08), pp 88-96).

6. "Numerical simulation of thawing process of biological tissues as porous media during cryosurgery", 5th World Congress on Biomechanics, Munich, Germany during July 29-Aug 04, 2006. Abstract in Journal of Biomechanics, Volume 39, Supplement 1, 2006, Page S384.

Dissertation Guided

Master of Science: 12   *Master of Philosophy:* 07

Ph. D.: Completed: 03   Submitted: 00   Continued: 04

Ph. D, scholars:

1. *Dr. Subhanshu Goyal:* Spectral Clustring Algorithm with Efficient Similarity Matrix Construction Variants for Noisy Image Segmentation.(2018)(Co-supervisors: Dr. M. A. Zaveri, Dr. A. K. Shukla & Prof. V. K. Katiyar)

2. *Dr. Sonalika Singh:* Mathematical Modelling of Phase Change Process Using Non-Fourier Heat Transfer.(2015)

3. *Dr. Ramesh S Damor:* Studies on Heat Transfer in Biological Tissue: A Fractional Calculus Approach.(2014)(Co-supervisor: Dr. A. K. Shukla)

Teaching & Research Experience

21st May 2009 continued	:	Assistant Professor, Department of Applied Mathematics & Humanities, S.V. National Institute of Technology Surat
26th March 2007- 16th May 2009	:	Lecturer in University Institute of Engineering and Technology, CSJM University Kanpur, UP- 208024.
26th March 2002-23rd March 2007	:	Tutorial Classes and Computer Lab. of M. Sc., M.C.A. and M. Tech. at I.I.T. Roorkee during Ph.D.

Subject Taught

Partial Differential Equations and Their Applications	:	In M. Sc. at S.V. National Institute of Technology Surat
Numerical Methods	:	In M. Sc at SVNIT Surat
	:	Tutorial classes in M. Tech. at IIT Roorkee during Ph.D. and computer lab in M.Sc.
Engineering Mathematics I, II & III	:	In B. Tech. at UIET, CSJM University Kanpur.
	:	In B. Tech. at SVNIT Surat.
Mathematical Modelling	:	Tutorial class in M.Sc. and M.C.A at IIT Roorkee during Ph.D and lecture classes in M.Phil. at UIET, CSJM University Kanpur.
C++	:	Computer lab in M.Sc. during Ph.D.

Course Developed

1. "Partial differential equations & their application" for 5 year integrated M. Sc. in Mathematics (8th Semester).

2. "Advanced numerical techniques" for 5 year integrated M. Sc. in Mathematics (9th Semester)

List of Summer/Winter School/ Training Program Organized

1. Coordinator of TEQIP sponsored one week STTP on Transform Methods in Science and Engineering in Applied Mathematics & Humanities Department, SVNIT, during March 6-10, 2017.

2. Coordinator of TEQIP sponsored 3 days workshop on Fixed Point Theory and Dynamical Systems with Real World Applications in Applied Mathematics & Humanities Department, SVNIT Surat, during February 23-25, 2017.

3. Coordinate of TEQIP sponsored one week STTP on Computational Techniques for Differential Equations in Applied Mathematics & Humanities Department, SVNIT Surat, during 02-06 May 2016

4. Co-coordinator of TEQIP sponsored one week STTP on "Mathematical Methods for Scientist and Engineers", in Applied Mathematics & Humanities Department, SVNIT Surat, during 29 June-10 July, 2015

5. Coordinator of TEQIP sponsored one week STTP on "Numerical methods in Engineering and Science", in Applied Mathematics & Humanities Department, SVNIT Surat, during Jan 1-5, 2014

6. Coordinator of TEQIP sponsored one week STTP on "Optimization Techniques for Scientists and Engineers"., in Applied Mathematics & Humanities Department, SVNIT Surat, during Jun 17-21, 2013

7. Organizing committee member of Lecture Series on Number theory in Applied Mathematics & Humanities Department, SVNIT Surat, during September, 3-4, 2011.

8. Lecture Series on Partial Differential Equations & their Applications in Applied Mathematics & Humanities Department, SVNIT Surat, during August 27-28, 2011.

List of Conference /Seminar/Workshop/Network Program Organized

1. Organizing committee member of 76th Annual Conference of Indian Mathematical Society held in SVNIT Surat in Dec 26-29-2010.

2. Joint- Secretary: International Conference of International Academy of Physical Sciences (CONIAPS-XIV) held during December 22-24, 2011 As a part of Golden Jubilee celebration of our institute SVNIT Surat.

3. Co-convener, International conference on special functions & their applications, held during June 27-29,2012 at SVNIT Surat

4. Coordinator of Online Quiz Competition on 26.10.2012 as a part of Workshop on Life of Srinivas Ramanujan and his contribution in the field of Mathematics organized by Department of Applied Mathematics & Humanities, SVNIT.

5. Member of organizing committee of 56th Congress of Indian Society of Theoretical and Applied Mechanics, organized by Department of Applied Mathematics & Humanities, SVNIT. During Dec-18-20, 2011.

6. Member of organizing committee of 19th national cum 4th international conference of Gwalior academy of Mathematica science, organized by Department of Applied Mathematics & Humanities, SVNIT. During Oct-3-6, 2014

Expert Lecturer Delivered

1. Delivered expert lectures in two days Workshop on Application of Differential Equations using MATLAB at Marwadi University, Rajkot on 22/04/17

2. Delivered expert lectures in one week STTP on Transform Methods in Science and Engineering held at SVNIT Surat, during March 6-10, 2017.

3. Delivered expert lectures in one week STTP on Computational Techniques for Differential Equations held at SVNIT Surat, during 02-06 May 2016.

4. Delivered lecture on Introduction to dynamic programming in TEQIP sponsored STTP on "Mathematical Methods for Scientist and Engineers", held at SVNIT Surat, during 29 June-10 July, 2015

5. Delivered expert lectures in TEQIP sponsored STTP on Numerical methods in Engineering and Science", held at SVNIT Surat, during Jan 1-5, 2014

6. Delivered expert lectures on Numerical methods and their MATLAB implementation in two days workshop on "Numerical Computation Using MATLAB at Veer Bahadur Singh Purvanchal University, Jaunpur U.P. India-222003 during November 26 - 30, 2015

7. Delivered one expert lectures on Mathematical modeling in TEQIP sponsored STTP on Modelling & optimization for engineering applications, held at SVNIT Surat during May 19-23, 2014.

8. Delivered lectures in TEQIP sponsored STTP on Numerical methods in Engineering and Science", held at SVNIT Surat during Jan 1-5, 2014

9. Delivered expert lectures in TEQIP sponsored STTP on Optimization Techniques for Scientists and Engineers held at SVNIT Surat during Jun 17-21, 2013

10. Delivered expert lectures in TEQIP sponsored STTP on Mathematical Methods for Physical Sciences and Engineering (MMPSE2013) held at SVNIT Surat during May 6-10, 2013

11. Delivered invited talk on Moving Boundary Problems and Their Solutions: An Introduction, at National Conference on Role of Mathematical and Physical Sciences in Engineering and Technology held at Government Degree College Karanprayag, Uttarakhand during October 21-22, 2011

Membership of Professional Bodies

1. Life Member of International Association of Engineers (IAENG). Membership No.: 65259

2. Life Member of Indian Mathematical Society, Membership No.: L /2011/22

3. Life Member of Indian Science Congress Association. Membership No.: L16911

4. Life member of Indian Society of Biomechanics, Membership No.: N-273

5. Life member of Indian Society of Theoretical and Applied Mechanics, Membership No. :-L/731

6. Life member of International Academy of Physical Sciences, Membership No.: N12201

Administrative Responsibilities

1. Co-chairman, SCOSH, Student council, SVNIT Surat (11/09/2018 – continued)

2. Hostel warden. (Associate warden: during from 04/10/2011 to 31/12/2013, Warden: 31/12/2013 to 04/06/2017)

3. Member of anti ragging committee. (from 04/10/2011 to 13/08/2014)

4. Member, Hindi cell, SVNIT Surat India. (from 17/01/2012 to continued)

5. Co-chairman, center for humanity resource development, student council, SVNIT Surat. (from 05/08/2011 to 23/07/2013)

6. Joint secretary, SVR school committee, SVNIT Surat India. (from 31/08/2012 to continued)

7. Member of admission committee, M. Sc. program. (from 21/04/2010 to Jun 2013)

8. Lab-In- Charge, computer lab, Applied Mathematics & Humanities Department, SVNIT Surat, India. (from 14/07/2009 to continued)

9. Member, Departmental library committee, Applied Mathematics & Humanities Department, SVNIT. (from 14/07/2009 to continued)

10. Coordinator, work load & time table committee, Applied Mathematics & Humanities Department, SVNIT Surat, India. (July 2015 to continued)

11. Coordinator, Departmental examinations cell, Applied Mathematics & Humanities Department, SVNIT Surat, India. (from Jan 2011 to July 15, 31/07/2017 to continued)

12. Coordinator, annual report, monthly report, website & MIS, Applied Mathematics & Humanities Department, SVNIT Surat, India. (from 14/07/2009 to continued)

13. Coordinator, research projects, Applied Mathematics & Humanities Department, SVNIT Surat, India (from August 2013 to continued)

14. Member, services to community & Tribal development committee, Applied Mathematics & Humanities Department, SVNIT Surat, India (from 31/07/2017 to continued)

15. Member, purchase committee, Applied Mathematics & Humanities Department, SVNIT Surat, India (from 31/07/2017 to continued)

Foreign Visits

1. Michigan Technological University, Houghton, USA, for research collaboration with Dr. Cecile M Piret, on Solution of fractional differential equations using Radial basis functions, during Sept 15-Oct 7, 2016.

2. Washington DC, USA , to present research paper at Spring 2012 Eastern Sectional Meeting of the American Mathematical Society (AMS) during March 17-18, 2012

3. Asian Institute of Technology Thailand during Sept 26-28, 2011.

4. Munich, Germany, to present research paper at 5tth World Congress on Biomechanics, from July-29 to August-04, 2005.

National Level Achievements

1. GATE 2001 Percentile score-82.66 All India Rank: 148th

2. NET July 2001 CSIR-UGC test for JRF & eligibility for lectureship (CSIR)

3. NET Dec 2001 CSIR-UGC test for JRF & eligibility for lectureship (CSIR)

4. GATE 2002 Percentile score- 98.33, All India Rank : 18th

5. NET Jun 2002 CSIR-UGC test for JRF & eligibility for lectureship (CSIR)

Scholastic Achievements

1. Awarded with national scholarship in graduation.

2. Awarded with half free-ship for securing second rank in class in M. Sc. at IIT Roorkee.

3. MHRD fellowship from 26th March, 2002 to 30th Nov, 2002.

4. CSIR-JRF from 1st Dec 2002 to 30th Nov 2004.

5. CSIR-SRF from 1st Dec 2004 to 23rd March 2007.

Academic Background

Ph.D.: Mathematics (Nov-2007)

Department of Mathematics, Indian Institute of Technology Roorkee, Roorkee (India)

Advisor: Prof. V.K. Katiyar, Department of Mathematics, IIT Roorkee, Roorkee

Thesis title: Mathematical Modelling of Solidification Processes

– Partial Differential Equations to model some problems related to solidification in biology (Cryosurgery) and alloy.

– Numerical Method using Finite Difference Method.

– MATLAB, C++

M.Sc.: Industrial Mathematics and Informatics (2001):

C.G.P.A- 7.76 (On 10-point scale)

Indian Institute of Technology Roorkee, Roorkee (India)

Thesis title: Simulation of a PERT Network

Advisor: Prof. Sunita Gakkhar, Department of Mathematics, IIT Roorkee, Roorkee (India).

B.Sc.: Physics, Chemistry and Mathematics (1998):

Marks: 75.4%

Sahu Jain College Najibabad, M. J. P. Rohilkhand University, Bareilly. UP (India)

Intermediate (10+2), Physics, Chemistry, Mathematics, English, Hindi, (1995)

Marks: 75.8%

M.D.S. Inter College Najibabad, Distt- Bijnor, U.P. Board Allahabad (India).

High School (10), Science-2, Maths-2, Biology, Social Sc., English, Hindi, (1993)

Marks: 67.83%

Inter College Newalgoan (Harara) Almora, U.P. Board Allahabad (India).

Personal Details

1. Fathers Name   :   Shri Teekam Singh
2. Date of Birth   :   February 23, 1979
3. Nationality   :   Indian
4. Marital status   :   Married
5. Language proficiency   :   Hindi and English
6. Address for Communication   :   Assistant Professor,
     Department of Applied Mathematics & Humanities,
     S.V. National Institute of Technology Surat
     (Ichchhanath), Surat-395007, Gujarat, India
7. Permanent Address   :   Vill. - Mahmudpur Bhawta, Post Kotwali Dehat,
     Nagina, Distt. - Bijnor (U.P.), India-246764

List of Referees

1. Prof. V. K. Katiyar
   Department of Mathematics,
   I.I. T. Roorkee, Roorkee
   Distt- Haridwar (Uttarakhand)
   Phone: 9897000998
   E-mail: vktmafma@iitr.ernet.in,
          vktmafma20@gmail.com

2. Dr. A. K. Shukla, Associate Professor
   Applied Mathematics & Humanities Department,
   S. V. National Institute of Technology Surat
   Ichchhanath-395007 (Gujarat)
   Phone: 9879109964
   E-mail: aks@amhd.svnit.ac.in,
          ajayshukla2@rediffmail.com

3. Prof. R. C. Mittal
   Department of Mathematics,
   I.I.T. Roorkee, Roorkee
   Distt- Haridwar (Uttarakhand)
   Phone: 9319912030
   E-mail: rcmmmfma@iitr.ac.in

4. Prof. Prawal Sinha
   Department of Mathematics & Statistic
   I.I.T. Kanpur
   Phone: +91512-259 7213
   Email: prawal@iitk.ac.in

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Last updated on: November 12, 2018