Curriculum Vitae

Gorachand Layek
(G. C. Layek)

PERMANENT ADDRESS	**UTTAR ARABINDA NAGAR, JUNBEDIA BY PASS MORE, SARANI NO.-3, BANKURA-722101.**
OFFICE ADDRESS	**DEPARTMENT OF MATHEMATICS, THE UNIVERSITY OF BURDWAN, GOLAPBAG, BURDWAN-713104, WEST BENGAL, INDIA.**
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MOBILE	**+917863975363**
PRESENT POSITION	**PROFESSOR OF MATHEMATICS**
DATE OF BIRTH	**05/01/1965**
PLACE OF BIRTH	**BANKURA**
SEX	**MALE**
NATIONALITY	**INDIAN**

1. EDUCATION QUALIFICATIONS:

DEGREE	UNIVERSITY/INSTITUTION	YEAR OF PASSING	
Ph. D. in Mathematics	I.I.T. Kharagpur, India	1997	
M. Sc. in Mathematics	I.I.T. Kharagpur, India	1990	
Post-Doctoral (Research Associate)	Indian Statistical Institute, Kolkata	1996-1998	

2. EMPLOYMENT RECORD:

UNIVERSITY/INSTITUTION	DESIGNATION	DURATION
THE UNIVERSITY OF BURDWAN	PROFESSOR of Mathematics	21/09/2010 TILL DATE (12^{+} years)
THE UNIVERSITY OF BURDWAN	READER/ASSOCIATE PROFESSOR	05/05/2007-20/09/2010
THE UNIVERSITY OF BURDWAN	SENIOR LECTURER/ASSISTANT PROFESSOR	02/01/2004-04/05/2007
THE UNIVERSITY OF BURDWAN	LECTURER/ASSISTANT PROFESSOR	02/08/2000-01/01/2004
NEW ALIPORE COLLEGE, KOLKATA	LECTURER/ASSISTANT PROFESSOR	03/01/2000-01/08/2000

3. PROFESSOR INVIT*É*, VISITING PROFESSOR, VISITING SCIENTIST, POST DOC AND Recognition:

[1] Awarded **Prestigious Position Professor Invite at Centrale Lille, France**, 2019, Research Area: "**Kolmogorov and Non-Kolmogorov Turbulence**".

[2] Awarded Visiting Professor at Kazan National Research Technological University, Russia, 2011 & 2013, Research Area: "Control of Flow Separation and non-Newtonian Fluid Flows".

[3] Academic visit at Saint Petersburg State University, Mathematics and Mechanics, Russia, 2008, Research Area: "Nonlinear Dynamics and Chaos Theory".

[4] Visiting Scientist at Indian Statistical Institute, Kolkata during, January-July, 1999.

[5] Awarded ICSC-World Laboratory (Calcutta Branch) POST-DOC Fellowship (1998-99) in Mathematical Physics in memory of S. Chandrasekhar.

[6] Post Doc (Research Associate) (CSIR, NEW DELHI) at Indian Statistical Institute, Kolkata from 1996-1998, Research Area: "Liquid Fluid Flows and CFD".

[7] UGC-Visiting Fellow at Vidyasagar University, Midnapure, during 07. 02. 2017 to 27. 02. 2017

[8] Included in the list of World's Top 2% Scientists 2021,2022 (Stanford University, USA)

4. ACADEMIC & ADMINISTRATIVE ASSIGNMENTS:

1. **Programme Coordinator: UGC-Special Assistance Programme (SAP)** at the level DSA-I during 2012-2017. Thurst Area: "Continuum Mechanics and Functional Analysis with their Applications".
2. Head, Department of Mathematics, Burdwan University, 19.06.10-20.09.12. His involvement in the parent University and attachment to the Department particularly is commendable and desire special attention.
3. Program Co-ordinator, DST-FIST program in the Mathematics Department, The University of Burdwan. UGC Expert Member for Project Evaluation, Sanction of new project and Review of on group project (2010-2012).
4. Elected Court Member, Burdwan University 2003-2008.
5. Council Member, Calcutta Mathematical Society 2008-2009
6. Chairman, UG & PG Boards, Burdwan University, 19.06.10-20.09.12.
7. Served as a member of different Universities—Central and State-aided (WB) in selection committees for the selection of the position Professor, Associate Professor and Assistant Professor.
8. Conducted viva-voce for the purpose of award of Ph.D. degree as an Expert in many Universities.
9. Doctoral Committee and RAC (Research Advisory Committee) in Mathematics, Member, Burdwan University.
10. UG & PG Boards, Member, Sindhu Kanu Birsha University, Purulia, 2012-2015.
11. Board of Studies in Mathematics, Member in Dibrugarh University, Assam from 2017
12. Board of Studies (BoS), External Expert Member for UG and PG education and Research activities in the Mathematics Department (Two Terms, Four Years), Visva-Bharati University, 2017-2019 and 2020-2022.
13. Board of Studies (BoS), External Expert Member for UG and PG education and Research activities in Mathematics First Term (2018-2022), Second Term (2022-2024) at Raja Narendra Lal Khan Women's College (Autonomous), Paschim Medinipur, W.B.
14. Research Advisory Committee (RAC) Member, Raja Narendra Lal Khan Women's College (Autonomous), Paschim Medinipur, W.B.
15. Served as Resource persons and delivered invited talk in different Refresher Courses in HRDC, in different National/International Seminars and Conferences.

5. REFEREEING EXPERIENCE:

[1] Proceedings of the Royal Society A
[2] Journal of Fluid Mechanics, Cambridge University Press
[3] Physics of Fluids, American Institute of Physics
[4] Chaos: An Interdiciplinary Journal, American Institute of Physics
[5] International Journal of Heat and Mass Transfer, Elsevier
[6] Meccanica, Springer
[7] International Journal of Communication in Heat and Mass Transfer, Elsevier
[8] The European Physical Journal B
[9] International Journal of Bifurcation and Chaos, World Scientific
[10] Chaos, Soliton and Fractals, Elsevier

6. ORGANIZING NATIONAL /INTERNATIONAL CONFERENCES/UGC REFRESHER COURSES(SELECTED ONLY):

[1] International Conference on Recent Advances in Mathematics and Applications (ICRAMA-2010), January 13-15, 2010. (Joint Convener)
[2] International Conference on Frontiers of Mathematics and Applications (ICFMA-2008), January 16-18, 2008. (Joint Convener)
[3] National Seminar on Advances in Mathematics and Applications (NSAMA-2006), 18-20 January, 2006. (Joint Convener)
[4] National Seminar on Recent Trends in Mathematics, 2001. (Joint Convener)
[5] Workshop on Numerical methods and Computer Programming for College Teaching , 2004. (Joint Convener)
[6] Fifteenth UGC-Refresher Course on Mathematical Sciences, 18 February -8th March, 2010. (Joint Convener)

7. RESEARCH INTEREST:

Turbulence, Chaos, Nonlinear Dynamics and Fractals.

8. PARTICIPATION AND DELIVERING FEW PLENARY/INVITED LECTURES IN CONFERENCE

TITLE	TITLE OF CONFERENCE/INSTITUTION	DATE
Magnetic control ...for electrically conducting fluids	Mathematical Modeling and Numerical Simulation, BBAU, Lucknow	01-07-2013
Symmetry-breaking flow bifurcation and its control	RTMA-2013, Digboi College, ASSAM	07-08-2013
Non-Kolmogorov dissipation and scaling laws in turbulent planer jet	Recent Trends in Applied Mathematics 2019, University of Calcutta	14-03-2019
Non-Kolmogorov dissipations in turbulent thermal plume	Non-Equilibrium Turbulence, Centrelle Lille, France	02-12-2019
Does God play dice in Nature?	W.B. Science and Technology Congress, Raja N L Khan Women's College, Midnapur	13-02-2023
Organized structures in chaotic motions	ICRAFMN, MIT Bengaluru	14-07-2023

9. TEACHING SUBJECTS:

[1] Special Papers:
   a) Viscous Flows, Boundary Layer Theory and MHD
   b) Turbulent Flows- I and II
[2] Dynamical Systems
[3] Chaos and Fractals
[4] Ordinary Differential Equations and Special Functions
[5] Partial Differential Equations
[6] Numerical Analysis
[7] Wavelet Analysis

10. RESEARCH PROJECTS & CO-ORDINATOR, UGC-SAP (DSA-I) (2012-2017):

1. **UGC RESEARCH PROJECT:** "Numerical study of viscous flow separation", (completed).

2. **CSIR RESEARCH PROJECT:** "Flow separations, Pulsating Flow: Theory, Computations and Applications", (completed).

3. **UGC SAP (DSA-I):** **Thrust Area: "Continuum Mechanics and Functional Analysis with their Applications"** at the level of Departmental Special Assistance (DSA-I), (2012-2017), (Co-ordinator: Prof. G C Layek and Deputy Co-ordinator: Prof. Mantu Saha). (completed).

11. RESEARCH GUIDANCE:

I. PH. D. GUIDANCE (No.: 13 (Awarded)), working three regular scholars

1. ***Dr. Mani Shankar Mandal*** **(2013)**
2. ***Dr. Rajib Basu*** **(2013)**
3. ***Dr. Krishnendu Bhattacharyya*** **(2013)**
4. ***Dr. Prativa Ranjan De*** **(2012)**
5. ***Dr. Md. Sharif Uddin*** **(2010) (with Prof. Wazed Ali PK, Rajshahi University)**
6. ***Dr. Chandaneswar Midya*** **(2008)**
7. ***Dr. Golam Kibria Midya*** **(2008) (with Dr. T. K. De, Burdwan University)**
8. ***Dr. Swati Mukhopadhyay*** **(2007) (with Prof. A. Samad, Burdwan University)**
9. ***Dr. Sambaran Pramanik*** **(2004) (with Prof. H. P. Mazumdar, I.S.I., Kolkata)**
10. ***Dr. Syamantak Halder*** **(2018) (**Boundary Layer Flows of non-Newtonian Fluids and Heat-Transfer**)**
11. ***Dr. Sunita*** **(2019) (**Scaling Laws and Symmetries of Turbulent Flows**)**
12. ***Dr. Naresh Chandra Pati*** **(2019) (**Quantifications of Chaotic Motions**)**
13. ***Dr. Bidyut Mondal*** **(2022) (**Boundary Layer Flow and Heat Transfer**)**

RESEARCH SCHOLAR (Working No.: 03)

1. *Purbasha Deb* (**Transitional routes and organized structures in chaotic motions**)
2. *Abir Baidya* (**Bifurcations and chaos in convection of fluid layers in non-porous and porous media**)
3. *Md. Asif* (**Chaos Theory and Analysis of Delay Systems**)

II. M. PHIL GUIDANCE (No.: 01)

1. *Mr. Ganesh Jana* (2010)

III. POST DOCTORAL GUIDANCE (No.: 01)

1. *Dr. Krishnendu Bhattacharyya*

12. RESEARCH CONTRIBUTIONS OF PROFESSOR G C LAYEK

Prof. G. C. Layek is a renowned Applied Mathematician currently working on turbulence, chaos and organized structures in fluid systems. The book ''An Introduction to Dynamical Systems and Chaos'' published in the year 2015, Springer (second edition will bring out soon) is noteworthy in this regard. The contributions on non-equilibrium turbulence Kinetic Energy (K.E.) dissipations and their novel scaling laws, transitional routes, organized structures specially in bi-parameter dynamics of chaotic motions are described below:

(1) Dissipation distinctions in non-equilibrium turbulence

In 1941, A. N. Kolmogorov proposed a theory of homogeneous equilibrium turbulence under statistical invariance and become popular after G. K. Bachelor's (1953) monograph on Kolmogorov's theory, in particular the law of K.E. dissipation $\bar{\varepsilon} = c_\varepsilon \left(\bar{k}\right)^{3/2} / L$. Recently, by adopting novel Lie group approach of statistical model equations, Layek and his research group established the existences of non-Kolmogorov dissipations for free shear turbulent flows, viz. for axi-symmetric wake, planar jet, planar and axi-symmetric plumes etc. The new dissipation law is expressed as $\bar{\varepsilon} = \left(\mathrm{Re}_G / \mathrm{Re}_l\right)^m \left(\bar{k}\right)^{3/2} l^{-1}$, l the local length scale, Re_G and Re_l are the global and local Reynolds numbers, and so c_ε is no longer constant for above flows, in general. The interesting point is that the parameter m is connected with the scaling group parameters depending upon turbulent flows, and $m = 0$ gives the Kolmogorov equilibrium dissipation law resulting in $\bar{k} \sim \overline{u_i' u_j'} \sim \bar{u}^2$. The conclusion is that the flow quantities including pressure-strain-rate equation maintain self-similarity that is, 'strong self-similarity' in case of Kolmogorov turbulence. Also, the spreading rates do not vary with the streamwise distance. We found that for $m \neq 0$ the dissipation is called 'non-Kolmogorov' satisfying $\bar{k} \sim \bar{u}^2 \neq \overline{u_i' u_j'}$ in the streamwise direction of the flow. What is the cause of it? The pressure-strain-rate equation does not maintain the self-similarity for $m \neq 0$ and the incompressible pressure even in turbulent flow has a decouple tendency. The spreading rates and entrainment coefficients of jet and plumes are not constant and are functions of streamwise distance, and agreed with experimental findings (Phys. Fluids: 30, 035101 and

115105, 2018 and Physical Review Fluids: 3(124605), 2018 & 6, 104602, 2021 and references therein). Analysis reveals that the turbulence scaling laws are fundamentally different scaling laws relating to scaling group parameters, and its role is significant for understanding turbulence. The relations between entrainment and dissipation in the Kolmogorov region of turbulence as well as the non-Kolmogorov region are established for jets, wakes and plumes.

(II) Chaos, Multiple Attractors and Organized Structures in Fluid Systems

Layek and Pati model (Phys. Lett. A, 381(41), 2017) got recognition for thermo-convection in fluid layer taking non-Fourier heat flux. The existence of Shil'nikov chaos via homoclinic explosion is explored. The convection of couple-stress fluid layer (Nonlinear Dynamics, 91(2), 837-852, 2018) exhibits intermittent chaos. The couple-stress creates an extra restoring force and so it synchronizes the system. The hyperchaos and coexistence of multiple attractors with their fractal basins are now active research interest in fluid dynamics. Layek and Pati (Int. J. Bifurcation and Chaos, 28(10), 2018) derived a hyperchaotic system in magneto-convection and showed the coexistence of multiple attractors.

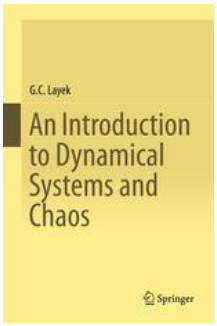
The thermal instability of viscoelastic fluid is well-studied problem and the system is prone to overstable motion. A new 6D nonlinear system is obtained. The 4D system exhibits catastrophic jump to chaos via a subcritical Hopf bifurcation, while the 6D system shows chaos via type-I intermittency in stable periodic motion due to supercritical Hopf bifurcation. The global dynamical behaviors are obtained using the largest Lyapunov exponent (LLE), and the Arnold tongue-like structures are formed. The period-bubbling route to chaos occurs and so fluid elasticity is necessary condition for this transitional route (Layek & Pati: IJBC, 30(06), 2030013, 2020). The period-bubbling cascade does not occur in the Newtonian fluid convection.

We explored the rotation-field induced occurrence of multiple coexisting attractors, viz., multi-periodic, periodic-chaotic attractors in the nonlinear model for the propagation of acoustic-gravity waves in the atmosphere when the slopes become small, and so the model correctly describes the nonlinear phenomena. Analysis reveals that the earth rotation instigates for creating heterogenous coexisting attractors. The conclusion is that order and chaos coexist, and the formation of well-organized coherent structures in a chaotic regime. The existence of a chaotic attractor implies that after a while, the wave breaks, and turbulence is developed (Pati, Rech and Layek: Chaos 31(2), 023108, 2021).

Further, the works reveal that how the temporal chaos in dissipative nonlinear systems, strange attractors, coexistence of model-locking and quasi-periodic motions leading to the Golden mean winding number at the criticality and shrimp-shape periodic structures in chaotic regimes developed in nonlinear systems (Chaos: An Interdisciplinary J. of Nonlinear Science, 29(9), 093104, 2019; Chaos, Soliton & Fractals, 140, 110184, 2020). In other way these studies help to explain transition routes and coherent structures in turbulence and are able to predict certain properties of noisy behavior, and the possibility of understanding complex turbulence in fluid, thermo-fluid and biochemical systems.

13. INTERNATIONAL BOOK PUBLISHED:

[1] **G. C. Layek**, " An Introduction to Dynamical Systems and Chaos", Springer, **2015**, ISBN (978-81-322-2555-3), ISBN(978-81-322-2556-0 (eBook).



Reviews: (i) "The text is a strong and rigorous treatment of the introduction of dynamical systems … . The exercises presented at the end of each chapter are suitable for upper-level undergraduates and graduate students. As a reference source, the text is very well-organized with its division of the subject into continuous and discrete dynamical systems. Summing Up: Recommended. Upper-division undergraduates through professionals and practitioners." - ***M. D. Sanford, Choice, Vol. 54(2), October, 2016***

(ii) ***"***This textbook provides a clear presentation of many standard topics in dynamical systems. Their coverage is based on the author's experience in the teaching and research of the subject. Overall, the book is well written in a clear logical manner. The chapter titles precisely indicate the topics covered by the author. These are: Chapter 1. Continuous Dynamical Systems; Chapter 2. Linear Systems; Chapter 3. Phase Plane Analysis; Chapter 4. Stability Theory; Chapter 5. Oscillations; Chapter 6. Theory of Bifurcations; Chapter 7. Hamiltonian Systems; Chapter 8. Symmetry Analysis; Chapter 9. Discrete Dynamical Systems; Chapter 10. Some Maps; Chapter 11. Conjugacy of Maps; Chapter 12. Chaos; Chapter 13. Fractals.

Throughout the book, both analytical and geometrical techniques are used in the study of continuous and discrete dynamical systems. Due to the combination of a careful development of the theory, many worked example problems, a variety of applications, and well-chosen exercises, An introduction to dynamical systems and chaos is very well suited as either a course text or for self-study by students. The book could also serve as a nice supplement to many of the other standard texts on dynamical systems."

Jason M. Graham, MathSciNet, Mathematical Reviews (AMS), 2016.

Twenty Best Publications of Prof. G. C. Layek

Q1:18, Q2:02

1. **G. C. Layek** and N. C. Pati, "Organized structures of two bidirectionally coupled logistic maps", *Chaos: An Interdiciplinary Journal of Nonlinear Science*, AIP, I.F. 3.741, Q1, **Vol. 29 (9), 093104 (2019).**
2. **G. C. Layek** and Sunita, "Multitude scaling laws in axisymmetric turbulent wake", *Physics of Fluids*, AIP, I. F. 4.98, Q1, **Vol. 30: 035101 (2018).**
3. **G. C. Layek** and Sunita, "Non-Kolmogorov dissipation in a turbulent planar jet", *Physical Review Fluids*, APS, I.F. 2.895, Q1, **Vol. 3(12): 124605 (2018).**
4. **G. C. Layek** and Sunita "Non-Kolmogorov scaling and dissipation laws in planar turbulent plume" *Physics of Fluids*, AIP, I. F. 4.98, Q1, **Vol. 30: 115105 (2018).**
5. **G. C. Layek** and N. C. Pati, "Bifurcations and chaos in convection taking non-Fourier heat -flux", *Physics Letters A*, Elsevier, I.F. 2.654, Q2, **Vol. 381(41), 3568-3575, (2017).**
6. **G. C. Layek** and N. C. Pati, "Bifurcations and hyperchaos in magnetoconvection of non-Newtonian fluids", *International Journal of Bifurcation and Chaos*, World Scientific, I.F. Q1, **Vol. 28(10): 1830034 (2018).**
7. **G. C. Layek** and N. C. Pati, "Chaotic thermal convection of couple-stress fluid layer", *Nonlinear Dynamics*, I.F. 5.741, Q1, **Vol. 91(2): 837-852 (2018).**
8. N. C. Pati, **G. C. Layek** and N. Pal, "Bifurcation and organized structures in a predator-prey model with hunting cooperation", *Chaos, Soliton & Fractals*, I.F.9.922, Q1, **Vol. 140, 110184 (2020).**
9. N. C. Pati, P. C. Rech, **G. C. Layek**, "Multistability for nonlinear acoustic-gravity waves in a rotating atmosphere", *Chaos: An Interdiciplinary Journal of Nonlinear Science*, AIP, I.F. 3.741, Q1, Vo**l. 31 (2), 023108 (2021).**
10. **G. C. Layek** and N. C. Pati, "Period-bubbling transition to chaos in thermo-viscoelastic fluid systems", *International Journal of Bifurcation and Chaos*, World Scientific, I.F. Q1, **Vol. 30 (06), 2030013 (2020).**
11. K. Bhattacharyya, S. Mukhopadhyay, **G.C. Layek** and I. Pop, "Effects of thermal radiation on micropolar fluid flow and heat transfer over a porous shrinking sheet", *International Journal of Heat and Mass Transfer*, Elsevier, I.F. 5.584, Q1, **Vol. 55(11), 2945-2952, 2012.**
12. S. Bandyopadhyay and **G.C. Layek**, "Numerical computation of pulsatile flow through a locally constricted channel" *Communications in Nonlinear Science and Numerical Simulation*, Elsevier, I.F. 4.186, Q1, **Vol. 16(1), 252-265, 2011.**
13. K. Bhattacharyya, S. Mukhopadhyay and **G.C. Layek**, "Slip effects on boundary layer stagnation-point flow and heat transfer towards a shrinking sheet", *International Journal of Heat and Mass Transfer*, Elsevier, I.F. 5.584, Q1, **Vol. 54(1), 308-313, 2011.**
14. **G.C. Layek**, S. Mukhopadhyay and Rama Subba Reddy Gorla, "Unsteady viscous flow with variable viscosity in a vascular tube with an overlapping constriction",

International Journal of Engineering Science, Elsevier, I.F. 7.155, Q1, **Vol. 47, 649-659, 2009.**

15. **G.C. Layek** and C. Midya, "Effects of constriction height on flow separation in a two-dimensional channel", *Communications in Nonlinear Science and Numerical Simulation*, Elsevier, I.F. 4.186, Q1,**Vol. 12, 745-759, 2007**.
16. **G.C. Layek**, S. Mukhopadhyay and Sk. A. Samad, "Heat and mass transfer analysis for boundary layer stagnation-point flow through a porous medium towards a stretching sheet with internal heat generation /absorption and suction/blowing", *International Communications Heat and Mass Transfer*, Elsevier, I.F. 6.782, Q1, **Vol. 34, 347-356, 2007.**
17. S. Mukhopadhyay, **G. C. Layek** and Sk. A. Samad, "Study of MHD boundary layer flow over a heated stretching sheet with variable viscosity", *International Journal of Heat and Mass Transfer*, Elsevier, I.F. 5.584, Q1, **Vol.48, 4460-4466, 2005**.
18. C. Midya, **G.C. Layek**, A.S. Gupta and T.R. Mahapatra, "Magnetohydrodynamic viscous flow separation in a channel with constrictions", *ASME Journal of Fluids Engineering*, ASME, I.F. 1.998, Q2, **Vol.125, 2003, pp.952-962.**
19. K. Bhattacharyya and **G.C. Layek**, "Effects of suction/blowing on steady boundary layer stagnation-point flow and heat transfer towards a shrinking sheet with thermal radiation", *International Journal of Heat and Mass Transfer*, Elsevier, I.F. 5.584, Q1, **Vol. 54, 302-307, 2011.**
20. S. Bandyopadhyay and **G.C. Layek**, "Study of magnetohydrodynamic pulsatile flow in a constricted channel" *Communications in Nonlinear Science and Numerical Simulation*, Elsevier, I.F. 4.186, Q1, **Vol. 17(6), 2434-2446, 2012.**

List of International Journal Publications

[Total : 100] Q1: 41, Q2:23

1. S. Garai, N. C. Pati, N. Pal and **G. C. Layek** "Organized periodic structures and coexistence of triple attractors in a predator-prey model with fear and refuge", *Chaos, Soliton & Fractals (ELSEVIER),* **Q1**, **165, 112833, (2022), I.F. 9.22**.
2. M. Hossain, N. C. Pati, S. Pal, S. Rana, N. Pal, **G. C. Layek**, "Bifurcation and multistability in a food chain model with nanoparticles", *Mathematics and Computers in Simulation (Elsevier),* **Q2**, **Vol. 190, 808-25 (2021), I.F. 3.601.**
3. Sunita and **G. C. Layek**, "Nonequilibrium turbulent dissipation in buoyant axisymmetric plume", *Physical Review Fluids,* **Q1**, **Vol. 6 (10), 104602 (2021), I.F. 2.895.**

4. S. Halder, S. Mukhopadhyay and **G. C. Layek**, "Effect of thermal radiation on Powel-Eyring fluid flow and heat transfer over a power-law stretching permeable surface", *International Journal for Computational Methods in Engineering Science and Mechanics* (TAYLOR & FRANCIS), **Q3**, **Vol. 22 (5), 366-375 (2021).**
5. N. C. Pati, S. Garai, M. Hossain, **G. C. Layek** and N. Pal, "Fear induced multistability in a predator-prey model", *International Journal of Bifurcation and Chaos (ELSEVIER),* **Q1**, **Vol. 31 (10), 2150150 (2021), I.F. 2.450.**
6. B. Mandal and **G. C. Layek**, "Unsteady MHD mixed convective Casson fluid flow over a flat surface in the presence of sleep", *International Journal of Modern Physics B,* **Q3**, **Vol. 32 (03), 2150038 (2021), I.F.1.422**.
7. N. C. Pati, P. C. Rech, **G. C. Layek**, "Multistability for nonlinear acoustic-gravity waves in a rotating atmosphere", *Chaos: An Interdiciplinary Journal of Nonlinear Science,* **Q1**, **Vol. 31 (2), 023108 (2021), I.F. 3.741.**
8. N. C. Pati, **G. C. Layek** and N. Pal, "Bifurcation and organized structures in a predator-prey model with hunting cooperation", *Chaos, Soliton & Fractals,* **Q1**, **Vol. 140, 110184 (2020), I.F. 9.22.**
9. **G. C. Layek**, B Mandal and K Bhattacharyya, "Dufour and soret effects on unsteady heat and mass transfer for Powel-Eyring fluid over an expanding permeable sheet", *Journal of Applied and Computational Mechanics*, **Q2**, **Vol. 6 (4), 985-998 (2020), I.F. 0.592.**
10. **G. C. Layek** and N. C. Pati, "Period-bubbling transition to chaos in thermo-viscoelastic fluid systems", *International Journal of Bifurcation and Chaos*, **Q1**, **Vol. 30 (06), 2030013 (2020), I.F. 2.450.**
11. **G. C. Layek** and N. C. Pati, "Organized structures of two bidirectionally coupled logistic maps", *Chaos: An Interdiciplinary Journal of Nonlinear Science,* **Q1**, **Vol. 29 (9), 093104 (2019).**
12. S. Halder, S. Mukhopadhyay, **G. C. Layek, "**Flow and heat transfer of Casson fluid over an exponentially shrinking permeable sheet in presence of exponentially mioving free stream with convective boundary condition**",** *Mechanics of Advanced Material and Structures,* **Q2**, **Vol. 26 (17), 1498-1504 (2019), I.F. 3.177.**
13. **G. C. Layek** and Sunita, "Multitude scaling laws in axisymmetric turbulent wake", *Physics of Fluids*, **Q1**, **Vol. 30: 035101 (2018), I.F. 4.980.**

14. **G. C. Layek** and Sunita, "Non-Kolmogorov dissipation in a turbulent planar jet", *Physical Review Fluids*, **Q1**, **Vol. 3(12): 124605 (2018), I.F. 2.895.**
15. **G. C. Layek** and Sunita "Non-Kolmogorov scaling and dissipation laws in planar turbulent plume" *Physics of Fluids,* **Q1**, **Vol. 30: 115105 (2018), I.F. 4.980.**
16. **G. C. Layek** and Sunita, "Multifractal cascade symmetry model for fully developed turbulence", *Fractals*, **Q1**, **Vol. 26(4):1850070 (2018), I.F. 3.154.**
17. **G. C. Layek,** B. Mandal, K. Bhattacharyya and A. Banerjee, "Lie symmetry analysis of boundary layer stagnation-point flow and heat transfer of non-Newtonian power-law fluids over a nonlinearity shrinking/stretching sheet with thermal radiation", *International Journal of Nonlinear Sciences and Numerical Simulation,* **Q2**, **Vol. 19(3-4), 415-426 (2018), I.F. 2.378.**
18. **G. C. Layek** and N. C. Pati, "Chaotic thermal convection of couple-stress fluid layer", *Nonlinear Dynamics,* **Q1**, **Vol. 91(2): 837-852 (2018), I.F. 5.741.**
19. **G. C. Layek** and N. C. Pati, "Bifurcations and hyperchaos in magnetoconvection of non-Newtonian fluids", *International Journal of Bifurcation and Chaos*, **Q1**, **Vol. 28(10): 1830034 (2018), I.F. 2.450.**
20. **G. C. Layek** and Sunita, "On the nature of multitude scalings in decaying isotropic turbulence*", International Journal of Non-Linear Mechanics,* **Q1**, **Vol. 95, 143–150 (2017), I.F.3.336.**
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