

Prof G Ambika, IISER Pune

Curriculum Vitae

- **Name** - G. Ambika
- **Designation**- Professor, Physics and Dean, Graduate Studies
- **Affiliation**- Indian Institute of Science Education & Research,
Dr Homi Bhabha Road, Pune –411 008, India
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Professional

- Editorial Board Member, Proceedings of Royal Society A , London
- Reviewer, Nature Scientific Reports, PLoS ONE, Physica A, BMC Bioinformatics, Chaos, Nonlinear Dynamics, Chaos Solitons and Fractals, J Theor Biology, Communications in Nonlinear Science & Numerical Simulation, Pramana, J Physics, J Earth System Science
- Reviewer, DST SERB Project Proposals
- Nodal Officer, Vigyan Jyothi, DST
- Subject Expert Committee (SEC) – Physical & Mathematical Sciences, DST Women Scientist Scheme (WOS-A)
- Associate, IUCAA, Pune
- Senate Member, NIT Raipur
- Subject Expert, Union Public Service Commission, Delhi
- Member, Board of studies, G. H. Rasoni Institute of Engineering & Technology, Pune
- Member, Board of studies, Maharajas College, Cochin
- Associate, Physical Research Lab, Ahmedabad 2008-10
- Member, Higher Education Council, Kerala, 2006-09

- Dean, Graduate studies, IISER Pune
- Chair, Internal Complaints Committee, IISER Pune

Professional training and experience

Nature of training	University / Institute	Period
Teaching & Research	Lecturer in Physics	1976-1989
Research	Post doctoral RA, CSIR, Cochin Univ. Sci. & Tech, Cochin	1989-1994
Teaching & Research	Reader in Physics, Maharajas College, Cochin, MG University	1994-2006
Administration	Principal, PMG College, Chalakkudy, Kerala	2006
Teaching & Research	Associate Professor, IISER, Pune	2006-2012
Teaching & Research	Professor of Physics , IISER Pune	2012-present
Academics Administration	Dean, Graduate Studies	2006- present

Education

Degree	University	Year	Subjects	Percentage
BSc	University of Kerala	1974	Physics(main), Chemistry and Maths	85.3
MSc	University of Kerala	1976	Physics	76.7- Distinction & I Rank
M. Phil	University of Kerala	1980	Physics	82.7- Grade A & I Rank
Ph.D.	Cochin University of Sci & Tech.(CUSAT), Cochin	1988	Theoretical Physics, Nonlinear Dynamics	

Awards/Recognitions

- VS Subramania Iyer Gold Medal for 1976 - first rank at the M Sc Exam in Physics
- V Sivarama Krishna Iyer Gold Medal for 1976 - first rank in M Sc Exam in Physics with distinction
- Ross Gold Medal for 1976 - the highest % of marks at the MA/M Sc degree exam held in April 1976.

- National Speaker in Nonlinear Dynamics under the Theoretical Physics Seminar Circuit Program (TPSC)-Cat.A for 1990-91 & Cat B 2002
- Teacher Invitee, Indian Academy of Sciences, Bangalore
- Best College Teacher Award (2003)-State level
- INSA visiting fellowship for research -2006-07
- Outstanding Faculty Award –IISER, Pune -2008-09

Recent Research Interests

Nonlinear Dynamics and Complex systems

Complex networks, recurrence networks from time series, emergent phenomena in coupled systems, multifractal analysis of astrophysical and physiological data, environmental effects in complex systems, control of dynamics on complex networks

Research Projects

- 'Study of Universal constants & Universality relations in Nonlinear Maps' awarded by the **UGC**, New Delhi during 1988-89.
- Stochastic resonance studies in Pendulum systems and two parameter maps' from **DST**, New Delhi – 2000-03.
- Emergent dynamics on growing networks with comparable time scales- from DST , Delhi- 2010-13
- **DST DAAD project** sanctioned on “Interacting networks to model and control dynamics of complex systems”- Exchange visits with Transdisciplinary Concepts and Methods, Potsdam, Germany-2012-14
- Complexity Measures from multifractal analysis to characterize ECG data for diagnosis and therapy- DST SERB- 2015- ongoing

Research Collaborations

- Prof Juergen Kurths, Potsdam Institute for Climate Impact Research, Potsdam, Germany
- Prof G Rangarajan, IISc, Bangalore
- Prof Vijayalakshmi Ravindranath, CNS, IISc, Bangalore
- Dr R Misra- IUCAA, Pune

- Dr K P Harikrishnan, Cochin College, Kochi
- Prof R E Amritkar, IITRAM, Ahmedabad

Research Group and Training

Post-doctoral Fellows

- Abhijit Sonawane- Jan2011-Aug2012
- Snehal Shekatkar- May 2016-June 2017

PhD students

- K I Thomas- Studies related to Chaotic behaviour in Nonlinear Dynamical Systems – May 2004.
- Sujatha N V- Chaos and Pattern formation in coupled Non linear maps- April 2005
- Kamala Menon – Fractal Patterns & Stochastic Resonance in Coupled Map Lattices – June2010
- Ambika K - Studies on stability, synchronization and scaling behavior in coupled nonlinear systems –Sept2010
- Resmi V – Environmental Effects in the dynamics of coupled nonlinear systems- July2012
- Snehal Shekatkar- Structure, Dynamics and Control of complex networks- May 2016
- Kajari Gupta- Dynamics on networks with varying time scales- ongoing
- Sandip V George- Dynamics of Variable stars - ongoing
- G A R S R K Kashyap- Connectivity and Complexity in Complex networks – ongoing
- Sneha Kachhara- Detection of dynamical transitions from data- ongoing

Project Assistants

- Yogesh .V.Deshpande -2011-12
- Ashutosh Agnihotri -2012-13

- Yamini Kotriwar- 2015-17

Undergraduate students

Summer/ semester projects supervised for MS / MTech/ BTech -60

Outreach Activities

- Lectures given in colleges & schools- **70**
- Resource person for refresher courses and SERC schools-**35**

List of selected publications (2010-17)

1. G. Kashyap and **G Ambika**, Mechanisms for tuning clustering and degree-correlations in directed networks, [arXiv:1705.01689v1](https://arxiv.org/abs/1705.01689v1) [physics.soc-ph], Journal of Complex Networks(2017)0000, 1-21
2. Snehal M. Shekatkar, Yamini Kotriwar, K.P. Harikrishnan and **G. Ambika**, Detecting abnormality in heart dynamics from multifractal analysis of ECG signals, [arXiv:1705.00121v1](https://arxiv.org/abs/1705.00121v1) [q-bio.TO], Scientific Reports 7: 15127(2017)- DOI:10.1038/s41598-017-15498-z, <http://rdcu.be/yuXc>
3. K. P. Harikrishnan, R. Misra and **G. Ambika**, Is a hyperchaotic attractor superposition of two multifractals, Chaos Solitons and Fractals(2017)
4. Rinku Jacob, K. P. Harikrishnan, R. Misra and **G. Ambika** , Recurrence network measures for hypothesis testing using surrogate data: application to black hole light curves- Commun Nonlinear Sci Numer Simulat (2018) 54, 84–99, doi.org/10.1016/j.cnsns.2017.05.018
5. Sandip V. George, **G. Ambika** and R. Misra, Detecting dynamical states from noisy time series using bicoherence- Nonlinear Dyn (2017) 89:465–479-, DOI 10.1007/s11071-017-3465-6
6. Rinku Jacob, K. P. Harikrishnan, R. Misra and **G. Ambika** , Cross over of recurrence networks to random graphs and random geometric graphs, Pramana – J. Phys. (2017) 88: 37-DOI 10.1007/s12043-016-1339-y
7. Rinku Jacob, K. P. Harikrishnan, R. Misra and **G. Ambika** , Measure for degree heterogeneity in complex networks and its application to recurrence network analysis, (2017) R. Soc. open sci. 4: 160757, <http://dx.doi.org/10.1098/rsos.160757>

8. Rinku Jacob, K. P. Harikrishnan, R. Misra and **G. Ambika** , Can recurrence networks show small-world property?- Phys Lett A 380, 2718-2723(2016)
9. Kajari Gupta and **G Ambika**, Suppression of dynamics and frequency synchronization in coupled slow and fast dynamical systems, Eur Phy J B 89(6), 1-8 (2016)
10. Rinku Jacob, K. P. Harikrishnan, R. Misra and **G. Ambika**, Characterization of chaotic attractors under noise: A recurrence network perspective, Commun Nonlinear Sci Numer Simulat, 41, 32-47(2016)
11. Rinku Jacob, K. P. Harikrishnan, R. Misra and **G. Ambika**, Uniform framework for the recurrence network analysis of chaotic time series, Phy Rev E 93, 012202 (2016)
12. Sandip V. George, **G. Ambika** and R. Misra, Effect of data gaps on correlation dimension computed from light curves of variable stars, Astrophys Space Sci , 360:5 (2015)
13. Bedartha Goswami, Snehal M. Shekatkar, Aljoscha Rheinwalt, **G. Ambika**, and Juergen Kurths, A random interacting network model for complex networks, Scientific Reports , 5:18183 ,(2015).
14. Snehal M. Shekatkar, Chandrasheel Bhagwat and **G. Ambika**, Divisibility patterns of natural numbers on a complex network, Scientific Reports , 5:14280 ,(2015)
15. Snehal M. Shekatkar and **G. Ambika**, Complex networks with scale-free nature and hierarchical modularity, Eur. Phys. J. B. , 88 ,(2015).
16. Snehal M Shekatkar & **G. Ambika**- Novel coupling scheme to control dynamics of coupled discrete systems- Commun Nonlinear Sci Numer Simulat 25, 50–65 (2015)
17. Chiranjit Mitra, **G. Ambika** and Soumitro Banerjee –Dynamical behaviours in time-delay systems with delayed feedback and digitized coupling - Chaos, Solitons and Fractals, 69, 188–200 (2014)
18. Tanvi P Gujarati and **G. Ambika**- Virus Antibody dynamics in primary and secondary Dengue infection- Journal of Mathematical Biology, 69, 1773-1800(2014)
19. K.P.Harikrishnan, R. Misra and **G. Ambika**- On the transition to hyperchaos and the structure of hyperchaotic attractors- European Physical Journal B, 86, 394 (2013)

20. K P Harikrishnan, **G. Ambika** and R Mishra-Characterising chaos-hyperchaos transition using correlation dimension- European Physical Journal, Special Topics, 222, 839–846 (2013)
21. B Goswami, **G. Ambika**, N Marwan and J Kurths- On interrelations between recurrences and connectivity trends between stock indices- Physica A, 391, 4364 (2012)
22. V Resmi, **G. Ambika** , R E Amritkar and G Rangarajan- Amplitude death in complex networks induced by environment- Phys Rev E 85, 046211(2012)
23. Abhijeet R. Sonawane, A. Bhattacharyay, M. S. Santhanam and **G. Ambika**- Evolving networks with bimodal degree distribution- European Physical Journal B 85,118 (2012)
24. K P Harikrishnan, R Mishra, **G. Ambika**- Revisiting the box counting algorithm for the correlation dimension analysis of hyper chaotic time series- Communications in Nonlinear Science & Numerical Simulation, 17,263(2012)
25. V Resmi, **G. Ambika** and R E Amritkar- General Mechanism for amplitude death in coupled systems- Phys Rev E 84, 046212 (2011)
26. **G. Ambika** and R E Amritkar- Synchronizing time delay systems using variable delay in coupling- Chaos, Solitons & Fractals, 44,1035, (2011)
27. K P Harikrishnan, R Mishra, **G. Ambika**- Nonlinear time series analysis of the light curves from the black hole system GRS 1915+105- Research in Astronomy & Astrophysics **11**, 71-90(2011)
28. V Resmi, **G. Ambika**; R E Amritkar- Synchronized states in chaotic systems coupled indirectly through a dynamic environment- Phys Rev E **81**,046216 (2010)

International academic visits (2010-16)

- Dynamic Days Asia Pacific 06- University of New South Wales (UNSW), Sydney and LaTrobe University, Melbourne, Australia- July 2010
- CHAOS2011-Crete, Greece- May 31-June03 2011
- Dynamic Days Europe-University of Oldenburg, Germany- Sept 11-16, 2011

- Potsdam Institute for Climate Impact Research, PIK, Potsdam, Germany- Sept 17-20, 2011, March ,2013
- Potsdam Institute for Climate Impact Research, PIK, Potsdam, Germany- DST DAAD, March 2013, Aug 2014
- University of Melbourne, Australia as part of delegation from IISER Pune for discussions on Blended BSc Curriculum- June7-11, 2015
- Dynamic Days Europe, University of Exeter, UK- Sept 05-11, 2015
- International Conference, Humboldt University, Berlin, July 2016

Organization(2010-16)

- Organized a session on “Women in Science: Global and Local scenario”- WiSeGaLS 2010-IISER, Pune- Feb 20, 2010
- Organized one session on “ Facing Challenges of student life” – Sept 18, 2010
- Organized “Flights of Fantasy”- an exhibition and workshop in Paintings, Oct 30,31, 2010
- Organized the Lecture Series in Physics by Nobel laureate, Sir Anthony J Leggett during Jan 06-Feb01, 2011 in 9 institutes in India
- Director of DST- SERC school in Nonlinear Dynamics at IISER, Pune during Dec 04-24, 2011.
- Organizer of National Conference on Nonlinear Systems and Dynamics-NCNSD2012 at IISER, Pune during July 12-15, 2012
- Co-organized Inter IISER Physics Meet- March 15-16, 2014
- Indo- US Workshop on Time Series Analysis WTSA 2015- jointly with SAMSI, USA- funded by Indo - US S&T Forum, New Delhi and NSF, USA- May 25-31, 2015 .

Design of curriculum

- As Member of Board of Studies, MG University, Kottayam, involved in revising the syllabus and designing courses for colleges under the University and the University Centre. Introduced special papers in Theoretical Physics and project work at the M Sc level
- As Member, Restructuring Committee for UG education, Higher Education Council, Kerala, involved in re-designing the UG education in Kerala, grading system and semester structure in the state.

- Took initiative in designing the courses and curriculum structure in Physics for Semesters 5-8 in IISER, Pune and the academic programs, courses like IDC, HSS.
- As Dean of Graduate studies at IISER Pune, developed the BS MS curriculum and course structure, grading pattern etc.
- Involved in the design of the curriculum for Blended BSc program jointly with University of Melbourne

Teaching- Courses taught in IISER, Pune

- PHY102-Electromagnetism & Optics- Spring2007
- PHY101- Mechanics- Fall2007
- PHY611- Classical Mechanics- Fall2008, Fall 2010, Fall2011, Fall2012, Fall2017
- PHY311-Classical Mechanics-Fall2008, Fall2009, Fall 2010, Fall2011, Fall2012, Fall2017
- PHY342-Nonlinear Dynamics-Spring 2009, Spring 2010, Spring 2014, Spring 2016
- PHY453- Dynamical Systems- Spring 2011
- PHY312- Classical Electrodynamics- Fall2014

Dec, 2017