# NCM WORKSHOP - ERGODIC THEORY AND FRACTALS

## DECEMBER 09-21, 2024

**Objectives of the Workshop**: Fractals and Ergodic Theory are two independent but interconnected disciplines of mathematics, each contributing to our knowledge of complex systems and patterns in nature. Fractals, which exhibit self-similarity at multiple scales, provide a geometric foundation for describing irregular and complicated structures. Fractals were widely known in mathematics thanks to the groundbreaking work of Mandelbrot in the 1970s, which also revealed their prevalence in natural phenomena such as coastlines, clouds, and ferns. The recursive nature of fractals allows for the representation of complexity through simple repeating methods, encouraging discoveries into the intrinsic order of seemingly chaotic systems.

Ergodic Theory, on the other hand, is concerned about the statistical behavior of dynamic systems over time. It delves into the concept of ergodicity, which occurs when a system's time average equals its ensemble average. This theory offers a basis for comprehending the long-term behavior of dynamic systems and has applications in information theory, probability, and physics.

In the study of modern theory of dynamical systems, of which Ergodic Theory can be considered as a branch, we often seek out patterns that appear with the evolution of time and sometimes such patterns can even be considered `static'. Certain examples of interest from the world of complex dynamical systems would be Julia sets and Mandelbrot sets. Also, in the study of hyperbolic dynamical systems, structures such as Smale's horseshoes appear as invariant sets and are often used as crucial tools to further our understanding of such systems. One thing common with these patterns is that they are self-repeating, or fractals! Hence a deeper knowledge of fractals is essential in the understanding of dynamical systems. In this workshop we seek to bring both the communities together and hope it will serve as a launching platform for many future collaborations.

**How to apply:** The online application form for NCMW - Ergodic Theory and Fractals is available at the following link:
https://www.atmschools.org/school/2024/NCMW/etf/application-form
Those who want to apply for the workshop should first register on the website: https://www.atmschools.org/user/register?destination=node/1455
The last date for receiving applications is **September 30, 2024.**

**Financial Support:** Boarding and lodging will be provided to the selected participants in IIT Hostels. **No travel support will be given.**

**Topics to be covered:**
Ergodic Theory, Conformal measures on Julia and limit sets, Thermodynamic Formalism - a quick introduction, Fractal Interpolations, Various Fractal Dimensions, Fourier Transform and fractals.

**Resource Persons:**
Prof. A.K.B. Chand, IIT Madras
Dr. Amit Priyadarshi, IIT Delhi
Dr. Senthil Raani, IISER Behrampur
Dr. Shrihari Sridharan, IISER Thiruvananthapuram
Dr. Sabyasachi Mukherjee, TIFR Mumbai
Dr. Nishant Chandgotia, TIFR-CAM Bangalore

**Sponsored By:**
National Centre for Mathematics (NCM)
Indian Institute of Technology Tirupati (IITT)

**Patron:**
Prof. K. N. Satyanarayana, Director, IIT Tirupati.

**Venue:**
Department of Mathematics and Statistics, Indian Institute of Technology Tirupati, Yerpedu – Venkatagiri Road, Yerpedu, Tirupati, Andhra Pradesh - 517619.

**Conveners:**
Dr. Srijanani Anurag Prasad, Dr. Shilpak Banerjee

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