Outline of the Lectures covered - NCM Ergodic Theory & fractals @ IIT-TPT

1) Basics from measure theory

σ-Algebra, outer measure, measure, Carathéodory criterion, support of a measure, Borel measure, Riesz Theorem, weak* convergence (Spherical measure)

2) Definition and properties of Lebesgue measure and Hausdorff measure.

-Equivalent definitions of Hausdorff measures, Examples.

3) Ahlfors David (AD) Regular sets - Computation of AD regularity of Generalized Cantor sets

Definitions and relation between Minkowski, Packing & Hausdorff dimensions with relevant examples and some properties.

Importance of Packing dimension over Minkowski dimension

4) Basics from Fourier Analysis:

Definition of Fourier transform on $L^1(\mathbb{R}^d)$, $L^2(\mathbb{R}^d)$ and on compactly supported measures on $\mathbb{R}^d$.
Plancherel theorem (Statement alone); properties of Fourier transform of compactly supported measures.

Computation of Fourier transform of Spherical measure in $\mathbb{R}^3$.

5) Definition of Cantor measure via weak limits; Extending the computation to Generalized Cantor measure. Fourier transform of Cantor ($\frac{1}{3}$-set) measure; Salem set - Construction;

Introduction to Fourier dimension and its relation with other fractal dimensions, Energy integrals;

6) Strichartz theorem on ball averages (Statement alone)
Introduction to Distance set problems and one of the techniques in that direction.