Indian Institute of Technology, Kanpur
Proposal for a New Course

Course No.:	MTHXXX
Course Title:	Entropy and Dynamics of Group Actions
Pre-requisite(s):	Instructor's Consent (knowledge of topology, functional analysis and measure theory essential; MTH729 helpful, but not necessary)
Credits:	L-T-P-A [C] – 3-0-0-0 [9]
Semester:	Even/Odd
Department:	Mathematics and Statistics
Proposer:	Keshab Chandra Bakshi

Course Objectives:

Entropy is a fundamental invariant in ergodic theory and topological dynamics, originally developed by Kolmogorov and Sinai for $\mathbb{Z}$-actions and later extended by Ornstein–Weiss to actions of amenable groups. More recently, Bowen and Kerr–Li developed the notion of sofic entropy, extending entropy theory to actions of sofic groups, which include all amenable and residually finite groups. This course introduces entropy for group actions, beginning with amenable entropy and progressing to sofic entropy. This new course complements the existing graduate course on ergodic theory by focusing on entropy and group actions. It will prepare students for advanced research in ergodic theory, dynamical systems, and operator algebras.

Course Contents:
The course will broadly cover the following topics:

Topics	No. of Lectures
Entropy for actions of Amenable Groups: Amenable groups and Følner sequences- Shannon entropy – Kolmogorov–Sinai entropy – Amenable measure entropy- the generator theorem – Examples: Bernoulli shifts, compact actions- conditional dynamical entropy- The Shannon- McMillan-Breiman Theorem- Amenable topological entropy- the variational principle.	14
Entropy for actions of Sofic Groups: Sofic groups -Boltzman Entropy- Sofic measure entropy- the generator theorem- Bernoulli action- Compact actions- Sofic topological entropy – the variational principle for sofic entropy- the relation between Sofic and amenable entropy.	16
Bowen's f-invariant and its relationship with Sofic Entropy- a brief overview on entropy and independence.	10
Total lectures:	40

Recommended Books/References:

1. P. Walters, *An Introduction to Ergodic Theory*, Springer, 1982.

2. D. Kerr & H. Li, *Ergodic Theory: Independence and Dichotomies*, Springer, 2016.

Dated: 11/03/2025   Proposer: _____ ([Keshab Chandra bakshi])

Dated: _____   DPGC Convener: _____

The course is approved / not approved

Chairman, SPGC

Dated: _____