MATH 669, SPRING 2025—TOPICS IN GEOMETRIC ANALYSIS

Tu+Th, 4:05—5:20, Ayres 112—A. Freire

Tuesday lectures: **Introduction to Ricci Flow**

References:

[TOP] Peter Topping, *Lectures on Ricci Flow*
[BRE] Simon Brendle, *Ricci Flow and the Sphere Theorem*
[CK] Ben Chow and Dan Knopf, *Ricci Flow: An Introduction*
[CLN] Ben Chow, Peng Lu, Lei Ni, *Hamilton's Ricci Flow*

Goals: Hamilton's 3-manifold theorem/ Four-manifolds with positive curvature operator/The pointwise 1/4-pinched sphere theorem/Intro. to singularity analysis

Thursday lectures: **Introduction to geometric General Relativity**

References:
[LEE] Dan Lee, *Geometric Relativity* (Ch. 7& Ch.8)
[ON] Barrett O' Neill, *Semi-Riemannian Geometry*
[MAR] Marc Mars, *Present Status of the Penrose Inequality*, Class. Quantum Grav. **26** (2009)
[FRA] Theodore Frankel, *Gravitational Curvature*

Goals: Marginally outer trapped surfaces/ Spacetime positive mass theorem/The Penrose inequality/ Black Hole uniqueness theorems/Symmetry of perfect-fluid matter models

Student presentations: topics will be selected by the instructor for 40-min student presentations. Each student enrolled will present 2 or 3 topics.