# MATH4800 - SUGGESTED PROJECTS

FALL 2023

**Project 1.** $p$-adic dynamics and the Smale-Williams Solenoid

**Keywords:** *Abelian groups, hyperbolic dynamics, strange attractors*
**Suggested resources:**

- Intro to $p$-adic numbers
- Inverse Limits
- Hasselblatt-Katok: Section 17.1
- Fourier Analysis on Groups

**Project 2.** Sturmian Subshifts and coding circle rotations

**Keywords:** *Elliptic dynamics, coding non-Markov systems, combinatorics*
**Suggested resources:**

- Substitutions in Dynamics, Arithmetics and Combinatorics, Pytheas Fogg: Chapter II.6
- Chaotic Dynamics, Geoffrey Goodson: Chapter 19
- Hasselblatt-Katok: Sections 1.3, 1.4

**Project 3.** The Anosov closing lemma and structural stabliity

**Keywords:** *Topological dynamics, perturbations, generic behavior*
**Suggested resources:**

- Proof of the Anosov closing lemma
- Hasselblatt-Katok: Sections 2.3, 2.4, 18.1, 18.2
- Anosov Diffeomorphisms on Tori, John Franks

**Project 4.** Fourier analysis on tori, ergodicity and mixing

**Keywords:** *Fourier series, measure-preserving dynamics*
**Suggested resources:**

- Some basics of Fourier series
- Hasselblatt-Katok: Section 4.2
- Fourier analysis on other groups

**Project 5.** Entropy and the Parry measure

**Keywords:** *Quantified chaos, dynamical invariants, precursor to thermodynamical formalism*
**Suggested resources:**

- Hasselblatt-Katok: Sections 4.3, 4.4c
- More notes on entropy

**Project 6.** Ergodic sums, averages and the Birkhoff ergodic theorem

**Keywords:** *Dynamical cocycles, statistical mechanics*
**Suggested resources:**

- Hasselblatt-Katok: Section 4.1a,c,f
- Another proof of the Birkhoff ergodic theorem
- Deterministic Central Limit Theorems