

Aperiodic Order

TENTATIVE SCHEDULE

1. Lec. 1 (March 12) Introduction: Wang tilings, Penrose tilings, quasicrystals, crystallographic restriction. (See Intro. in [So])
2. Lec. 2 (March 19) Sturmian sequences (parts of Ch.6 in [F]).
3. Lec. 3 (March 26) Substitution sequences (parts of Ch.1.2 in [F]).
4. April 2 & 9: Passover Holiday, no lecture
5. Lec. 4 (April 16, 14:00-16:00) “Crash course” in Dynamical Systems and Ergodic Theory (1.1.3, 1.4, 1.5 from [F] and other sources). May start this in Lecture 3 already.
6. April 23: Yom Atzmaut, no lecture
7. Lec. 5 (April 30) Continuation of the “crash course”
8. May 7: no lecture (away at a conference)
9. Lec. 6 (May 14) Spectral theory of measure-preserving systems (brief overview). Tiling and Delone set dynamical systems
10. Lec. 7 (May 21) Continuation; self-similar tilings (after Thurston) and associated dynamical systems
11. Lec. 8 (May 28) More on self-similar tilings; theorem about invertibility of the substitution map (recognizability is equivalent to aperiodicity in the appropriate setting).
12. Lec. 9 (June 4) Eigenvalues for tiling dynamical systems. Pisot condition.
13. Lec. 10 (June 11) Overview of the spectral theory for substitutions of constant length (Dekking’s coincidence condition, Morse and Rudin-Shapiro substitutions).
14. Lec. 11 (June 18) Mathematical diffraction (after A. Hof), connection to dynamical spectrum.
15. Lec. 12 (June 25) Projection method and model sets.

References

- [BG] M. Baake and U. Grimm, Aperiodic Order: Volume 1, A Mathematical Invitation. Encyclopedia of Mathematics and its Applications, 149. Cambridge University Press, 2013.
- [F] N. Pytheas Fogg, Substitutions in Dynamics, Arithmetics and Combinatorics. Lecture Notes in Mathematics, 1794. Springer-Verlag, Berlin, 2002.
- [Enc] D. Frettlöh and E. Harriss (developers), Tilings Encyclopedia (online).
- [GS] B. Grunbaum and G. C. Shephard, Tilings and Patterns. W. H. Freeman and Company, New York, 1989.
- [R] Ch. Radin, Miles of Tiles. Student Mathematical Library, 1. American Mathematical Society, Providence, RI, 1999.
- [Se] M. Senechal, Quasicrystals and Geometry. Cambridge University Press, Cambridge, 1995.
- [So] B. Solomyak, Tilings and Dynamics, 2006. Lecture Notes, available at <https://www.math.washington.edu/~solomyak/PREPRINTS/notes6.pdf>