**Title:** Distribution of moments of trace of Frobenius in arithmetic progressions and holomorphic projection.

**Abstract:** In the first part of the talk, we will see a brief introduction to theory of equidistribution and Sato Tate conjecture. In the second part of the talk we will study moments of the trace of Frobenius of elliptic curves if the trace is restricted to a fixed arithmetic progression. We will see an asymptotic formulas for moments for cases for which the prime $p$ goes to infinity for fixed $r$ and cases where the power $r$ goes to infinity with fixed $p$. As a special case we recover a result of Birch proving Sato-Tate distribution for certain family of elliptic curves. Moreover, we will see that these results follow from similar asymptotic formulas relating sums and moments of Hurwitz class numbers where the sums are restricted to certain arithmetic progressions. This is a joint work with Kathrin Bringmann and Ben Kane.