Lesson 2 : Introduction to spectral geometry, by A. Girouard

The goal of this course is to survey the fundamentals of spectral geometry. The principal characters will be the Laplace operators, together with its eigenvalues and eigenfunctions.

1. The Laplace operator. The Dirichlet spectrum of a bounded domain. The spectrum of a closed Riemannian manifold. Links with the wave equation and vibrations. The spectrum is discrete. Marc Kac's famous question : *Can we hear the shape of a drum ?*.
2. The Rayleigh quotient and variational characterisation of the spectrum. Weyl's law on asymptotics.
3. Nodal domains. Chladni plates. Courant and Pleijel theorems.
4. Extremal problems. The Polyá conjecture. The Faber–Krahn inequality. Numerical simulations.