# נושאים נבחרים באנליזה 4 – 106937
## סמסטר חורף תשפ"א
### מרצה: פרופ' רם בנד

**Course name**: Spectral theory of quantum (metric) graphs

**Description**:
A quantum (metric) graph is a graph whose edges are assigned lengths and the whole graph is equipped with a self-adjoint differential operator, by default the Laplacian. Quantum graphs form a convenient model for studying a variety of spectral properties and exploring new mathematical and physical concepts.

Their relative simplicity allows to discover and prove many results from spectral theory and quantum chaos.

This course will give an introduction to quantum graphs, their spectra and eigenfunctions and we will employ quantum graphs in order to grasp key concepts in spectral theory and quantum chaos.

In particular, we will try to cover some of the following topics:
*) Self-adjoint extensions
*) Trace formulae
*) Variational methods
*) Inverse problems
*) Isospectrality
*) Nodal domains
*) Scattering
*) Interlacing theorems
*) Magnetic fluxes

In addition, we will demonstrate the connections between the spectral properties of quantum graphs and the analogous results for manifolds on one hand, and for combinatorial graphs on the other hand.