Spectral graph theory is the study of a graph via algebraic properties of matrices associated with the graph. The current course will cover the basics of the field as well as applications to theoretical computer science. In particular, after a short linear algebra refresher, tentatively, we plan on covering

1. The theory of linear algebra of symmetric matrices
2. Cheeger's inequality
3. Expander graphs - properties and constructions
4. Ta-Shma's explicit construction of codes close to the Gilbert-Varshamov bound
5. Graph sparsification

I suggest you'll watch Spielman's talk Miracles of Algebraic Graph Theory to get a sense of what this course is mostly about.

For more information, see the coure homepage at
https://www.gilcohen.org/2020-spectral-graph-theory