

SPECTRA AND COLOURS

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This course will focus on eigenvalue bounds for parameters related to colourings of graphs: the maximum size of a clique, the maximum size of a coclique, and the chromatic number.

One central topic will be the Erdős-Ko-Rado theorem. This states that we have a family \mathcal{F} of k -subsets of set V of size v , and any two members of \mathcal{F} have at least one point in common, then

$$|\mathcal{F}| \leq \binom{v-1}{k-1}.$$

Further, if equality holds, then our family must consist of the k -subsets that contain a given point of V . In graph theoretic terms, this result is equivalent to characterizing the cocliques of maximum size in the so-called Kneser graphs.

Colouring problems also play a non-trivial role in quantum information theory. This has led to a number of new graphical parameters, including what is now known as the quantum chromatic number of a graph. We will discuss this, and see that the tools of algebraic graph theory provide useful information in this new situation.

Some material relevant to this course will appear at <http://www.math.uwaterloo.ca/~cgodsil/aveiro/>.

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