CO 749: Topics in Graph Theory – Induced subgraphs – Winter 2023

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This course is intended to give an overview of algorithms related to induced subgraphs.

Topics might include (in decreasing order of likelihood to appear):

- Recognition (Is G in a given class of graphs defined by forbidding induced subgraphs?)

- Independent set and/or colouring (If G does not contain H as an induced subgraph, can we colour G in polynomial time?)

- Graph widths such as treewidth, twinwidth (What general frameworks guarantee efficient algorithms?)

- LOCAL algorithms (If each vertex only knows parts of the graph near itself, can it still say something meaningful about the graph?)

Reading: There is no suggested reading.

Prerequisites: This course will be mostly self-contained. It would be helpful to know a little bit about the following:

- Graph theory notions (connected, cycle, colouring);

- Analysis of algorithms (Is this a polynomial-time algorithm?);

- Graph algorithms (we can find a shortest path from u to v in polynomial time);

- NP-completeness and reductions (3SAT).

We will review these briefly as well. Note that this class is independent from my Winter 2022 edition of CO 749: you do not need to know material from that class, and this class is designed to minimize repetition.

Feel free to email sspirkl@uwaterloo.ca in case of any questions!