



## THESIS ASSIGNMENT

**Name and Surname:** Bc. Erik Řehulka  
**Study programme:** Computer Science (Single degree study, master II. deg., full time form)  
**Field of Study:** Computer Science  
**Type of Thesis:** Diploma Thesis  
**Language of Thesis:** English  
**Secondary language:** Slovak

**Title:** Cyclic edge-connectivity of cubic graphs

**Annotation:** Cyclic edge-connectivity proved to be an important invariant of graphs, especially cubic ones, since it is tied to many graph properties and can be used in various proofs. A common approach involves decomposing a larger cubic graph along its smallest cycle-separating edge-cut into two smaller ones. Moreover, it has been shown that the smallest counter-examples to many widely-open conjectures have high cyclic edge-connectivity, besides many other properties like the absence of a 3-edge-colouring. For this reason, several authors provided constructions of various not 3-edge-colourable cubic graphs with high cyclic edge-connectivity. The most common approach is to construct a larger graph by interconnecting several building blocks obtained from smaller graphs. Despite its common usage, there are no established tools for proving the desired cyclic edge-connectivity of graphs obtained through this approach.

**Aim:** This work aims to contribute to the theory of cyclic edge-connectivity of cubic graphs, mostly from two points of view:

1. To develop theoretical tools for proving that various constructions of cubic graphs from smaller building blocks have the desired cyclic edge-connectivity. This should emerge from an analysis of published constructions of infinite families of cubic graphs and from providing proofs of the claimed cyclic edge-connectivity for the respective classes.
2. To provide various methods on how to decompose a larger cubic graph with a given cyclic edge-connectivity into (usually two) smaller cubic graphs with at least the same cyclic edge-connectivity. These decomposition methods can also care for retaining other properties (like not being 3-edge-colourable).

**Supervisor:** Mgr. Jozef Rajník, PhD.  
**Department:** FMFI.KI - Department of Computer Science  
**Head of department:** prof. RNDr. Martin Škoviera, PhD.

**Assigned:** 12.12.2023

**Approved:** 03.01.2024  
prof. RNDr. Rastislav Kráľovič, PhD.  
Guarantor of Study Programme



Comenius University Bratislava  
Faculty of Mathematics, Physics and Informatics

---

.....  
Student

.....  
Supervisor