



## Dottorato di Ricerca in Ingegneria dell'Informazione PhD Program in Information Engineering

# GRAPH LABELINGS, COLORINGS AND THEIR APPLICATIONS

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**Abstract:** This course focuses on two fundamental subjects in graph theory: labelings and colorings. We will see how these topics originated through their practical applications, the main known results and some of the many problems still open. No previous knowledge of graph theory is required.

### Lecture plan.

**1 March, 9.30-11.30.** Preliminary concepts. Vertex labelings. Ringel-Kotzig conjecture.

**2 March, 9.30-11.30.** Graceful tree conjecture. Graceful graphs.

**4 March, 9.30-11.30.** Generalizations and applications of graceful labelings. Vertex-colorings.

**5 March, 9.30-11.30.** Sequential vertex-coloring algorithm. Five-color theorem and four-color theorem. Applications.

**8 March, 9.30-11.30.** Edge-colorings. Sequential edge-coloring algorithm.

**9 March, 9.30-11.30.** Bipartite graphs and Koenig's theorem. Connections with graph decompositions, factorizations and applications.

**11 March, 9.30-11.30.** 1-factorizations and applications to tournaments. Perfect 1-factorization conjecture.

**12 March, 9.30-11.30.** 2-factorizations, the Oberwolfach problem and its generalizations. Open problems.

The course will take place through synchronous lessons on Microsoft Teams.

Students interested are requested to contact: **Prof. Anita Pasotti ([anita.pasotti@unibs.it](mailto:anita.pasotti@unibs.it))**

