**Study programmes**: Doctoral studies of the programme Mathematics – Applied Mathematics

**Course name**: 3M539 – Graph Algorithms and their Applications

**Lecturers**: Zoran Stanić

**Status**: Optional

**ECTS**: 9

**Attendance prerequisites**: No

**Course aims**: Introducing students to graph algorithms. Working with the relevant software packages.

**Course outcome**: Upon completion of the course students know some algorithms on graphs, know how to apply them in solving specified problems. Trained for independent scientific work in this field. They should also be able to use some of the software packages.

**Course content**: Graphs and subgraphs, incidence and adjacency matrix of a graph. Graph invariants. Review of classical algorithms on graphs with emphasise on their applications. Independent and dominate sets of graphs. The problem of covering graphs, algorithms for its solution and implementations. Graph colouring and chromatic polynomial. Algorithms for graph colouring and applications. Center, radius, the absolute center and *p*-centers of a graph. Algorithms for the determination of the absolute and *p*-centers. Minimal spanning tree of a graph, Steiner problem - algorithms for solving and applications. Hamiltonian and Eulerian cycles - various algorithms for their determination and their efficiency. Software packages and their implementations.

**Literature**:

1. J.A. Bondy, U.S.R. Murty, *Graph Theory*, Springer, Berlin, 2011.
2. N. Christofides, *Graph theory – An Algorithmic Approach*, Academic Press, London 1975.

| **Number of hours: 10** | **Lecures: 4** | **Research work: 6** |
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**Teaching and learning methods**: Lectures and Consultations

**Assessment (maximal 100 points)**

| **Course assignments** | **points** | **Final exam** | **points** |
|---|---|---|---|
| Lectures | - | Written exam | - |
| Exercises / Tutorials | - | Oral exam | - |
| Colloquia | - | Written-oral exam | 70 |
| Essay / Project | 30 | | |