Technische Universität München

Module Description

MA5234: Graph Theory

Department of Mathematics

Module level:	Language:	Module duration:	Occurrence:
Master	English	one semester	irregularly

Credits*:	Total number of hours:	Self-study hours:	Contact hours:
5	150	105	45

* The number of credits can vary depending on the corresponding SPO version. The valid number is always indicated on the Transcript of Records or the Performance Record.

Description of achievement and assessment methods:
The exam will be in written form and take 60 minutes. In addition, a grade bonus will be awarded to students who regularly attempt homework assignments. In the exam, students demonstrate that they have understood and can apply fundamental constructions and results encountered in the course. Students are expected to be able to explain definitions and theorems, and apply them to specific problems and examples. Furthermore, students are expected to be able to use proof techniques encountered in the course and apply them.

Possibility of re-taking:
In the next semester: No
At the end of the semester: Yes

(Recommended) requirements:
MA0004 Linear Algebra 1, MA0005 Linear Algebra 2 and Discrete Structures.

Contents:
Basic notions of graph theory: paths and cycles, connectivity, trees. Matchings and stable matchings. The notion of k-connectivity and Menger's theorem. Planar graphs, graph drawing, and Kuratowski's theorem. Colouring, including the chromatic number and the 5-colour theorem. Matrix theory: the adjacency, incidence, and Laplacian matrices. Some applications of graph theory, including to data analysis.

Study goals:
Upon successful completion of the module, students are able to understand and apply basic techniques of graph theory to solve problems. In particular, they can explain the definitions and constructions encountered in class, they know fundamental results about matchings, connectivity, planar graphs, colouring, and the matrix theory, and they can apply these results to solve problems. Furthermore, they are familiar with some basic applications of graph theory in applied mathematics.

Teaching and learning methods:
The module consists of lectures with accompanying exercise sessions. For each exercise session there will be a list of problems, which students can use to test their understanding of the material. Students who regularly attempt to solve problems and hand in their work will be awarded a grade bonus. The problems on the list will be discussed in the exercise sessions.

Media formats:
Blackboard, slides, lecture notes, problem sheets.

Literature:
Diestel, Graph Theory.

Thulasiraman and Swamy, Graphs: Theory and Algorithms.

Responsible for the module:
Rolle, Alexander; Dr.: alexander.rolle@tum.de

Courses (Type, SH) Lecturer:

For further information about this module and its allocation to the curriculum see:
https://campus.tum.de/tumonline/wbModHb.wbShowMHBReadOnly?pKnotenNr=3050034

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