

Methods and Problems in Discrete Mathematics						
Type of Module Advanced Module				Module Code AM-MPdM		
Identification Number	Workload	Credit Points	Term	Offered Every	Start	Duration
MSc-M-MPdM	270 Hours	9 CP	1. – 3. Semester	Every 2 years, WiSe	Winter semester	1 Semester
1	Course Types a) Lecture b) Exercise Exam preparation		Contact Time 56 h 28 h	Private Study 112 h 56 h 18 h	Planned Group Size b) 30 Students	
2	<p>Module Objectives and Skills to be Acquired</p> <p>In discrete mathematics, the focus lies on the development and refinement of methods for solving specific problems.</p> <p>The aim of the module is to put together and try out a toolbox of important methods that come from a number of different mathematical areas.</p> <p>After successful participation, students will be able to</p> <ul style="list-style-type: none"> - list and apply basic methods of discrete mathematics - identify specific problems as problems of discrete mathematics and classify them according to difficulty - apply methods of discrete mathematics to specific problems and, if necessary, modify them profitably. <p>Furthermore, the ability to work independently is imparted with the help of relevant specialist literature. In addition to deepening the lecture material, the exercises also serve to acquire communication and presentation skills.</p>					
3	<p>Module Content</p> <ol style="list-style-type: none"> 1. Linear algebra: counting with determinant and permanent 2. Algebra: polynomial method, combinatorial zero theorem 3. Analysis: Szemerédi regularity and applications 4. Topology: The Borsuk-Ulam theorem and the coloring of graphs 5. Probability Theory: Models for Random Graphs 6. Geometry: spherical t designs <p>Literature: e.g. N. Alon, J. Spencer - The probabilistic method J. Matousek - Using the Borsuk-Ulam theorem (Lectures on topological methods in combinatorics and geometry)</p>					
4	<p>Teaching Methods</p> <p>Lecture and Exercise</p>					
5	<p>Prerequisites (for the Module)</p> <p>Formally: None</p> <p>Regarding the Contents: Knowledge in the mathematics of Operations Research</p>					
6	<p>Type of Examination</p> <p>Exam</p>					

7	<p>Credits Awarded</p> <p>The module is passed and credit points are awarded if the 180-minute final exam is passed or the 30-45-minute oral final exam is passed. The prerequisite for admission to the exam is regular successful completion of the exercises. The respective lecturer announces the exact requirements at the beginning of the event. Registration is required to take the final exam; A resit examination is offered at the beginning of the following semester. Repeated participation in the lecture and the exercises to prepare for a repetition of the final examination is possible. The module is graded.</p>
8	<p>Compatibility with other Curricula</p> <p>The module is part of the master courses “Mathematik” and “Wirtschaftsmathematik”</p>
9	<p>Proportion of Final Grade</p> <p>9/114</p>
10	<p>Module Coordinator</p> <p>Prof. Dr. F. Vallentin</p>
11	<p>Further Information</p>