

# Syllabus

## *Kursbeschreibung*

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| <b>Titel der Lehrveranstaltung</b>                  | Discrete Mathematics                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Code der Lehrveranstaltung</b>                   | 76239                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Zusätzlicher Titel der Lehrveranstaltung</b>     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Wissenschaftlich-disziplinärer Bereich</b>       | MATH-01/A                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Sprache</b>                                      | Englisch                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Studiengang</b>                                  | Bachelor in Informatik                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Andere Studiengänge (gem. Lehrveranstaltung)</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Dozenten/Dozentinnen</b>                         | Prof. Dr. Oliver Kutz,<br>Oliver.Kutz@unibz.it<br><a href="https://www.unibz.it/en/faculties/engineering/academic-staff/person/35483">https://www.unibz.it/en/faculties/engineering/academic-staff/person/35483</a>                                                                                                                                                                                                                                                         |
| <b>Wissensch. Mitarbeiter/Mitarbeiterin</b>         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Semester</b>                                     | Erstes Semester                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Studienjahr/e</b>                                | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>KP</b>                                           | 6                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Vorlesungsstunden</b>                            | 40                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Laboratoriumsstunden</b>                         | 20                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Stunden für individuelles Studium</b>            | 90                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Vorgesehene Sprechzeiten</b>                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Inhaltsangabe</b>                                | The aim of this course is to introduce students to basic topics in discrete mathematics. An overview of proof methods and their relation to logic will be given. The induction principle is introduced in a number of variants, and methods to analyse and describe the main properties of relations, functions, graphs and trees will be studied. We will also introduce the basic principles governing the mathematical definitions of infinite sets and of countability. |

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| <b>Themen der Lehrveranstaltung</b>                           | <ul style="list-style-type: none"> <li>- Elements of logic, propositions and quantifiers, methods of mathematical proof, method of mathematical induction</li> <li>- Numbers and basic number theory</li> <li>- Set Theory, Russell Paradox and Halting Problem</li> <li>- Functions, infinite cardinalities and countability</li> <li>- Relations, orders, equivalence classes</li> <li>- Graphs and trees</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Stichwörter</b>                                            | Logic and proof, number theory and sets, functions and cardinality, relations and orders, graphs and trees                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Empfohlene Voraussetzungen</b>                             | There are no prerequisites for this course.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Propädeutische Lehrveranstaltungen</b>                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Unterrichtsform</b>                                        | The course includes frontal lectures and lab exercises.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Anwesenheitspflicht</b>                                    | Attendance is not compulsory but recommended. Non-attending students have to contact the lecturer at the start of the course to agree on the modalities of the independent study.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Spezifische Bildungsziele und erwartete Lernergebnisse</b> | <p>Knowledge and Understanding</p> <ul style="list-style-type: none"> <li>- D1.1: Have a solid knowledge of mathematical analysis, algebra, numerical calculus, discrete mathematics and elementary notion of logic that are in support of computer science</li> </ul> <p>Applying knowledge and understanding</p> <ul style="list-style-type: none"> <li>- D2.1: Be able to use the tools of mathematics and logic to solve problems.</li> </ul> <p>Ability to make judgments</p> <ul style="list-style-type: none"> <li>- D3.2: Be able to work autonomously according to the own level of knowledge and understanding.</li> </ul> <p>Communication skills</p> <ul style="list-style-type: none"> <li>- D4.1: Be able to use one of the three languages English, Italian and German, and be able to use technical terms and communication appropriately.</li> </ul> <p>Learning skills</p> <ul style="list-style-type: none"> <li>- D5.1: Have developed learning capabilities to pursue further studies with a high degree of autonomy.</li> </ul> |

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| <b>Spezifisches Bildungsziel und erwartete Lernergebnisse (zusätzliche Informationen)</b> |                                                                                                                                                                                                                                                                                                                            |
| <b>Art der Prüfung</b>                                                                    | The written exam includes verification questions, knowledge transfer tasks, and exercises.                                                                                                                                                                                                                                 |
| <b>Bewertungskriterien</b>                                                                | Final written exam counting 100% for the evaluation and covering the full program of the course. Written exam questions will be evaluated in terms of correctness, clarity, quality of argumentation, and problem solving ability.                                                                                         |
| <b>Pfichtliteratur</b>                                                                    | Susanna Samuels Epp. Discrete Mathematics with Applications. Cengage Learning, 5th edition, 01 2019. ISBN 978-1337694193. URL: <a href="https://www.cengage.com/c/discrete-mathematics-with-applications-5e-epp/9781337694193">https://www.cengage.com/c/discrete-mathematics-with-applications-5e-epp/9781337694193</a> . |
| <b>Weiterführende Literatur</b>                                                           | K.H. Rosen and K. Krithivasan. Discrete Mathematics and Its Applications: With Combinatorics and Graph Theory. McGraw-Hill Companies, 2012. ISBN 9780070681880.                                                                                                                                                            |
| <b>Weitere Informationen</b>                                                              | If the use of specific software is required, it will be communicated during class by the lecturer.                                                                                                                                                                                                                         |
| <b>Ziele für nachhaltige Entwicklung (SDGs)</b>                                           | Hochwertige Bildung                                                                                                                                                                                                                                                                                                        |