

# Syllabus

## Kursbeschreibung

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| <b>Titel der Lehrveranstaltung</b>                  | Linear Algebra  |
| <b>Code der Lehrveranstaltung</b>                   | 76238   |
| <b>Zusätzlicher Titel der Lehrveranstaltung</b>     |   |
| <b>Wissenschaftlich-disziplinärer Bereich</b>       | MATH-02/A   |
| <b>Sprache</b>                                      | Englisch  |
| <b>Studiengang</b>                                  | Bachelor in Informatik  |
| <b>Andere Studiengänge (gem. Lehrveranstaltung)</b> |   |
| <b>Dozenten/Dozentinnen</b>                         | Prof. Bruno Carpentieri,<br>Bruno.Carpentieri@unibz.it<br><a href="https://www.unibz.it/en/faculties/engineering/academic-staff/person/38064">https://www.unibz.it/en/faculties/engineering/academic-staff/person/38064</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 present a rather comprehensive treatment of linear algebra and its applications, giving a general overview of the field. It covers vector and matrix theory to some degree of mathematical logic and rigor, emphasizing topics useful in other disciplines such as solving linear equations and computing determinants and eigenvalues of matrices. The course also provides practice in using linear algebra to think about problems in |

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|   | computer science, and in actually using linear algebra computations to address these problems.   |
| <b>Themen der Lehrveranstaltung</b>                           | <ul style="list-style-type: none"> <li>- Background on complex numbers, trigonometry and polynomials</li> <li>- Vectors and matrices</li> <li>- Linear Systems</li> <li>- Vector spaces</li> <li>- Linear operators</li> <li>- Spectral analysis</li> </ul>  |
| <b>Stichwörter</b>  | Linear algebra, vectors, dot product, orthogonality, matrices, matrix operations, linear systems, Gaussian elimination, LU factorization, rank, consistency, homogeneous systems, vector spaces, subspaces, basis, dimension, rank–nullity theorem, linear transformations, range, kernel, determinants, eigenvalues, eigenvectors, spectral analysis, applications in computer science.   |
| <b>Empfohlene Voraussetzungen</b>                             | There are no prerequisites for this course.  |
| <b>Propädeutische Lehrveranstaltungen</b>                     | There are no prerequisites for this course.  |
| <b>Unterrichtsform</b>  | The course includes frontal lectures and exercises.  |
| <b>Anwesenheitspflicht</b>                                    | Attendance is not compulsory, but non-attending students must contact the lecturer to agree on independent study modalities.   |
| <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</li> </ul> |

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|   | <p>communication appropriately.</p> <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>  |
| <b>Spezifisches Bildungsziel und erwartete Lernergebnisse (zusätzliche Informationen)</b> |  |
| <b>Art der Prüfung</b>  | The written exam will include verification questions, transfer-of-knowledge questions, and exercises. The aim is to assess the extent to which students have acquired knowledge and understanding, are able to apply that knowledge, and can demonstrate critical judgment. The same assessment criteria apply to both attending and non-attending students.   |
| <b>Bewertungskriterien</b>  | The final written exam accounts for 100% of the grade and covers the entire program. Exam questions will be assessed based on correctness, clarity, quality of argumentation, and problem-solving ability. The same evaluation criteria apply to both attending and non-attending students.  |
| <b>Pflichtliteratur</b>   | <ul style="list-style-type: none"> <li>• Gilbert Strang. Introduction to Linear Algebra. Wellesley-Cambridge Press, Wellesley, 4th edition, February 2009. ISBN 978-0-9802327-1-4.</li> <li>• Gilbert Strang. Algebra lineare. Apogeo Education, 1st edition, 2008. ISBN 978-88-387-8607-5.</li> <li>• Carl D. Meyer. Matrix analysis and applied linear algebra. SIAM: Society for Industrial and Applied Mathematics, Philadelphia, May 2010. ISBN 978-0-89871-454-8.</li> </ul> |
| <b>Weiterführende Literatur</b>   | Philip N. Klein. Coding the Matrix: Linear Algebra through Applications to Computer Science. Newtonian Press, Newton, Mass., 1st edition, September 2013. ISBN 978-0-615-88099-0.  |
| <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  |