**Valid from** 2024.HS

# Module description: Linear Algebra 1

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|---|---|
| **Module Code** | t.BA.XXM3.LA1.19HS |
| **ECTS Credits** | 4 |
| **Language of Instruction/Examination** | German |
| **Organizational Unit** | IAMP |
| **Module Coordinator** | Chantal Landry |
| **Legal Framework** | The module description is part of the legal basis in addition to the general academic regulations. It is binding. During the first week of the semester a written and communicated supplement can specify the module description in more detail. |
| **Module Characteristic** | Type 2b<br><br>2 times 2 lecture lessons (not necessarily consecutive) per semester week and class |
| **Module Description** | Students are familiarised with and master the basic concepts and propositions of linear algebra and analytic geometry. They can formulate simple concrete questions in the mathematical language and are able to solve these independently and present their solutions. |
| **Module Content** | **Vector geometry:**<br><br>• Definition of free and bound vectors<br>• Vector calculus in two- and three-dimensional space<br>• Applications in analytic geometry (lines and planes)<br><br>**Matrices:**<br><br>• Definition of a real Matrix and special square matrices<br>• Arithmetic operations on matrices<br>• Invertible matrix<br><br>**System of linear equations:**<br><br>• Definition of a linear system and its representation using matrices<br>• Solvability of a linear system and rank of a matrix<br>• Solving a linear system: Gaussian elimination, Gauss-Jordan elimination, Cramer's rule<br>• Applications: matrix inversion and evaluating linear independence of a set of vectors<br><br>**Determinant**<br><br>• Definition of the determinant of a square matrix<br>• Properties and calculation rules of the determinant<br>• Laplace expansion for computing determinants<br>• Applications |
| **Prerequisite Knowledge** | Knowledge of the mathematics of the federal vocational baccalaureate |

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**Learning Objectives (Competences)**

| Students... | Competencies | Taxonomies |
|---|---|---|
| You know vectors in two- and three-dimensional space and are familiar with the arithmetic operations of vector geometry. | M, F | K2, K3 |
| You can analytically describe and solve geometric problems of the plane and the space with the help of the vector calculation. | M, F | K2, K3 |
| You are familiar with the matrix calculus and can use it. | F, M | K2, K3 |
| You can formulate linear systems of equations and determine, if these systems are solvable. | M, F | K2, K3 |
| You know algorithms for solving linear systems of equations and can apply them. | F, M | K3 |
| You master the essential properties and calculation rules of the determinants. | F, M | K2 |
| You know algorithms for calculating determinants and can apply them. | F, M | K3 |

**Performance Assessment**

| End-of-module exam | Assessment | Length (min.) | Weighting | Form |
|---|---|---|---|---|
| written exam | Grade | 90 | 80 | acc. to module agreement |

| Performance assessment during the semester | Assessment | Length (min.) | Weighting | Form |
|---|---|---|---|---|
| Intermediate test<br>*An intermediate written test, the mark for which, in the event of a positive contribution, counts for only 20% of the total mark.* | Grade | 45 | 20 | acc. to module agreement |

**Classroom Attendance Requirement**

None

**Learning material**

- Gramlich, G. Lineare Algebra: Eine Einführung. Carl Hanser. ISBN 978-3-446-44140-8.
- Ruhrländer, M. Lineare Algebra für Naturwissenschaftler und Ingenieure. Pearson Studium. ISBN 978-3-86894-271-2.
- Papula, L. Mathematik für Ingenieure und Naturwissenschaftler (Bände I und II). 12 Edition. Springer. ISBN 978-3-8348-9987-3.

**Comments**