

# Course Outline

Virtual Exchange Spring Semester 2025

**Course Title: Business Mathematics 2**

**Number of ECTS-Credits: 5**

**Format of the course:**

- synchronous online course (FIX timeslots)
- asynchronous online course (NO fix timeslots)
- mix of synchronous and asynchronous online course
- synchronous hybrid course (students can choose online OR on campus in FIX timeslots)
- asynchronous hybrid course (students can choose online OR on campus in NON-fix timeslots)
- mix of synchronous and asynchronous hybrid course
- other, namely:

**Number of Students accepted**

- Total number of students is limited to
- Total number of students is unlimited
- Total number of virtual exchange students is limited to 3
- Total number of virtual exchange students is unlimited

**Responsible lecturer: Patrik Christen**

**Link to lecturer's profile at FHNW:** <https://www.fhnw.ch/en/people/patrik-christen> and <https://patrikchristen.com>

**Please contact the lecturer if you enroll for this course:**  
[\(patrik.christen@fhnw.ch\)](mailto:patrik.christen@fhnw.ch)

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## 1. Course content

Linear algebra is introduced through the lens of complex systems and artificial intelligence. It covers the fundamental concepts of vectors and matrices, systems of linear equations, linear transformations, determinants, and eigenvalues and eigenvectors. The course forms the basis for many advanced and modern topics such as complex systems science, artificial intelligence, machine learning, data science, and cryptography. It follows a virtual flipped classroom and is therefore taught entirely virtual and involves a large portion of guided and autonomous self-study.

## 2. Learning objectives

Knowledge and understanding:

Students understand and are able to explain basic linear algebra concepts and are able to relate these basic linear algebra concepts to complex systems and artificial intelligence case studies. **(Obj. 2.1)**

Application of knowledge and understanding:

Students are able to solve respective exercises and discuss case studies. **(Obj. 4.1)**

Ability to make judgements:

Students can interpret solutions and justify assumptions of methods from linear algebra.

Communication:

Students can express, in own words, mathematical results of methods from linear algebra.

Self-learning skills:

Students can learn new concepts and methods from linear algebra.

## 3. Prior knowledge and entry requirements

- As this module requires participants to be able to discuss complex issues fluently, a good level of English is required min. B2/C1 (CEFR), IELTS 5.5, TOEFL iBT 46-59 or equivalent
- There are no further formal entry requirements for this course.

## 4. Course structure and dates (Mondays, 17.15h – 21.00h; however, this is a totally asynchronous course/Info about deadlines will follow. Individual student coachings are available upon request)

1	Live Online Meeting: Course Introduction Video: Motivation Vectors and Matrices Guided Self-Study: Vectors and Matrices	Coaching in Chat or Virtual Meeting
2	Guided Self-Study: Vectors and Matrices	Coaching in Chat or Virtual Meeting
3	Video: Motivation Systems of Linear Equations Guided Self-Study: Systems of Linear Equations	Coaching in Chat or Virtual Meeting <b>Deadline Assignment 1: Vectors and Matrices</b>
4	Guided Self-Study: Systems of Linear Equations	Coaching in Chat or Virtual Meeting
5	Video: Motivation Linear Transformations Guided Self-Study: Linear Transformations	Coaching in Chat or Virtual Meeting <b>Deadline Assignment 2: Systems of Linear Equations</b>
6	Guided Self-Study: Linear Transformations	Coaching in Chat or Virtual Meeting
7	Video: Motivation Determinants Guided Self-Study: Determinants	Coaching in Chat or Virtual Meeting <b>Deadline Assignment 3: Linear Transformations</b>
8	Guided Self-Study: Determinants	Coaching in Chat or Virtual Meeting

9	Video: Motivation Eigenvalues and Eigenvectors Guided Self-Study: Eigenvalues and Eigenvectors	Coaching in Chat or Virtual Meeting <b>Deadline Assignment 4: Determinants</b>
10	Guided Self-Study: Eigenvalues and Eigenvectors	Coaching in Chat or Virtual Meeting
11	Guided Self-Study: Eigenvalues and Eigenvectors	Coaching in Chat or Virtual Meeting
12	Live Online Meeting: Review, Evaluation, and Outlook	<b>Deadline Assignment 5: Eigenvalues and Eigenvectors</b>

## 5. Assessment

- Assessment with (online)presentation, report, groupwork, test etc. during semester
- Final written test on campus can be replaced for remote students with an additional assignment
- Final written test on campus can be replaced for remote students with oral testing

## 6. Literature

Recommended reading: David Poole. Linear Algebra: A Modern Introduction. 4th Edition, Cengage Learning, 2015.

## 7. Grading

Pass-fail

According to swiss grading system (see below)

Mark	6.0	5.5	5.0	4.5	4.0	below 4
In words	excellent	very good	good	satisfactory	pass	fail