Mathematics - Course Participation and Conduct Rules (Code of Conduct)

Welcome to the mathematics course, which we are adapting to the challenges and opportunities of the 21st century. Please read the following rules carefully – adherence to them is a condition for passing the subject.

1. Course Philosophy: Why are we changing the rules of the game?

Before we present the rules, we want you to understand *why* we are introducing them. The traditional model of teaching, based on passively listening to lectures, is no longer effective. We have diagnosed several key problems that you may have also noticed in yourself:

- **Huge differences in skill level:** The group includes people with very different mathematical and language preparations. In a standard lecture, some people get bored while others get lost right from the start.
- **Problem with consistency:** Passively watching lecture recordings is not very effective. Backlogs pile up, and trying to catch up on the material just before a colloquium ends in stress and superficial learning.
- **The temptation of "shortcuts":** In the age of AI, it is easy to get a ready-made solution without understanding what lies behind it. Such an approach leads nowhere – it's an illusion of learning that doesn't build real competencies.

In response to these challenges, we are moving away from passive listening in favor of **active learning and critical thinking**. Our goal is not to teach you how to find the answer, but how to **independently arrive at an understanding of the problem**.

In this model, artificial intelligence (AI) is not a homework-doing machine, but your **interactive, personalized learning partner** – a tutor available 24/7 who adapts to your pace. You can also learn at a bus stop with just a phone and an app. There are practically no time or technological barriers, only a barrier of willingness to learn. This solution allows for the **individualization of learning** – if you already know something, you can move on, and if you need more time to understand the basics, the AI will patiently help you.

Your role as a student

You are now an **active participant, not a passive recipient**. Your responsibility for the educational process increases, but so do your opportunities. We expect you to:

- **Learn actively:** Work through the material independently *before* classes, using the prepared guides and engaging in dialogue with AI.
- **Work systematically:** Learning mathematics is a continuous process. Regular work with the provided sets is the only way to avoid backlogs and truly understand the material.
- **Think critically:** Learn to verify the information obtained from AI. Remember that language models can make mistakes. Your task is to assess the correctness and understand the logic of the solution, not to mindlessly copy answers.

Our role as instructors

In this model, the instructor ceases to be merely a transmitter of knowledge. They become a **mentor and an architect of your educational path**. Our tasks evolve:

- **Architect of Didactic Paths:** We design the entire learning process, create interactive guides, and set goals. We give you the map, and AI helps with navigation.

- **Inspirator and Mentor:** AI has no passion. We build context, motivate, inspire, and answer the question: "Why is this important?".
- **Discussion Moderator:** We use class time for discussions that take learning to a higher, conceptual level and teach argumentation.
- **Problem Diagnostician:** As experienced educators, we can diagnose the *source* of a problem in your reasoning and offer targeted help, which AI often cannot do.

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2. Structure and Didactic Materials

The course is based on the **"Flipped Classroom"** model. This means you acquire theoretical knowledge on your own at home/outside of class, and we use the time in class for workshops, discussions, and optionally solving more complex problems.

Didactic Sets:

We have prepared **12 comprehensive didactic sets** for you.

They cover **three basic areas**:

- Linear Algebra,
- Analytic Geometry,
- Differential Calculus.

These are not "dry" lists of problems, but interactive guides that will lead you step-by-step through the learning process in dialogue with AI.

Scope of the material:

Linear Algebra

- **Matrices:** introduction, arithmetic operations, types, determinants (Laplace, Gauss-Jordan), properties, algebraic complements, minors, rank, methods for finding the inverse matrix.
- **Linear Equations:** systems of equations, Cramer's rule, matrix method, Gaussian elimination.

Analytic Geometry

- **Vector Algebra:** coordinate systems on a plane and in space, vectors and their operations, bases, coordinates in a new basis, vector projections, dot product, cross product, and scalar triple product – properties and applications.
- **Curves and Surfaces:** description in Cartesian spaces, parameterization, explicit and implicit equations.

Mathematical Analysis

- **Differential Calculus:** sequences, functions, limits; derivatives (definition, rules, higher orders); applications: extrema, inflection points, optimization; geometric interpretations: tangents, rates of change; Taylor series, differentials.
- **Integrals:** definite and indefinite integrals, the fundamental theorem of calculus, methods: substitution, integration by parts; applications: areas, volumes of solids of revolution, arc lengths, accumulation functions, probability distributions; geometric interpretation: accumulation under a curve.
- **Differential Equations:** ordinary differential equations (ODEs), modeling physical systems, population dynamics, growth and decay processes, connecting integral calculus with the description of real-world phenomena.

Introductory Session ("Session Zero")

Before we begin, we will dedicate the first class (or part of it) to discussing the technical aspects of the course. The goal is to ensure that every student feels comfortable with the required tools. We will show, among other things: how to effectively use AI learning modes, how to save your work (e.g., using the SingleFile plugin), and how to navigate the entire course repository. This is the time to ask technical questions so that the technology barrier does not become a problem in your future learning.

Work Tools and Communication

- **Language Models (LLMs):**
  - Gemini (Google): https://gemini.google.com/
  - ChatGPT: https://chat.openai.com/
  - Grok (XAI): https://x.ai/
  - QWEN (Alibaba): https://chat.qwen.ai/
  - Claude (Anthropic): https://www.anthropic.com/
- **Other:**
  - SingleFile (for saving notes as HTML): https://singlefile.com/
- **Books** (optional):
  - **Linear Algebra Done Right** (Undergraduate Texts in Mathematics) by Sheldon Axler
  - **Essential Calculus Skills Practice Workbook with Full Solutions** by Chris McMullen
  - **Modern Calculus and Analytic Geometry** by Richard A. Silverman

Dedicated AI learning modes

To fully leverage the potential of modern language models, it's worth knowing how to activate their **specialized educational modes**. This isn't just about giving commands but also using built-in features that turn AI into an interactive tutor.

- **Gemini – Learning mode and interactive quizzes:** Open **Gemini** and click **Learning mode** above the input field. Enter what you want to learn and start the session. If you want to test your knowledge, ask for an interactive quiz. Currently, Gemini's quiz is the best in terms of quality and interactivity.
- **ChatGPT – Learn:** Open **ChatGPT** and on the start screen, click **Learn**. Choose one of the options: **Help me with homework**, **Explain a topic to me**, or **Create a practice quiz**. Provide the topic or command and send.
- **Grok – personalizing teaching style:** Go to **Automatic/Personalize** and choose the **Socratic** response style. Return to the input field and provide the topic or method of work. The Socratic style involves asking questions that lead you to discover knowledge on your own.
- **Other LLMs (Qwen, Claude):** Although they don't have a dedicated learning mode, you can ask for explanations, examples, and quizzes in a normal conversation.

Archiving the Learning Process

If you use AI tools in your learning process, it is your responsibility to document these interactions. Every conversation with AI regarding course material must be saved, for example, as a single file (using the SingleFile extension for your browser). Such an archive will be the basis for discussion during the final oral interview.

What do we expect from your archive? The archive is not just proof of your work, but above all, a record of your thought process:

- **Quality of interaction:** Do you ask in-depth questions, request examples and alternative explanations, rather than just asking for ready-made solutions?
- **Critical analysis:** Do you verify the AI's answers, ask about unclear parts, or try to find errors in the model's reasoning?
- **Independence:** Does the conversation show that you first tried to tackle the problem on your own, and AI served as support when you got stuck?

In the first class, we will show an example of a perfectly documented interaction with AI.

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3. Assessment and Grading Conditions

Grading Conditions:

The exercises are mandatory. Passing them is a necessary condition to be eligible for the lecture exam (KW1), which is conducted by Prof. P. Gutech.

- **Sufficient Grade (3.0):** The condition for receiving a sufficient grade is passing **3 online colloquia** (where a minimum of 80% of points is required). The colloquia allow for a maximum grade of 3.0. We know you will use AI, and online tests do not allow for a full assessment of understanding.
- **Higher Grades (3.5-5.0):** To obtain a higher grade, you must also pass an **oral exam** at the end of the semester. The basis for this interview is the documentation of your work by completing at least 12 interactive guides. During the interview, your deep understanding of the material, ability to explain concepts, and defend your proposed solutions will be assessed. Just like in job interviews, you will need to demonstrate your ability to argue and think critically.

Colloquium Dates:

The colloquia will be conducted online on the MS Teams platform with at least a 48-hour window to complete the test. This will help avoid time and technical issues. The dates of the colloquia will be announced well in advance to give everyone time to prepare. The duration of each colloquium is 48 hours from the moment it opens, so excuses like "I didn't have time to do it because I was busy" will not be considered. Only unforeseen circumstances, such as serious illness (hospitalization!) or other officially documented situations, will be considered individually. A common cold, a sprained ankle, and other minor ailments that allow for normal online test-taking will not be considered a valid excuse for not taking the colloquium. And not taking any of the colloquia will result in failing the entire course.

- **Colloquium 1:** (date to be announced later)
- **Colloquium 2:** (date to be announced later)
- **Colloquium 3:** (date to be announced later)

The MS FORMS system will be used via the MS Teams platform. Naturally, a "**Test Colloquium**" will be conducted beforehand so that everyone can familiarize themselves with the form and method of the online test at their own pace.

Consultations

There are **3 online consultation dates** scheduled during the semester on the MS Teams platform. These are meetings for people who have specific questions or problems with the material or organizational matters. If you do not need help, your presence is not required.

- **Consultation 1:** (date to be announced later) - [Link to Teams meeting]
- **Consultation 2:** (date to be announced later) - [Link to Teams meeting]

- **Consultation 3:** (date to be announced later) - [Link to Teams meeting]

As instructors, we are available only during class hours and the indicated consultation times. The semester consists of 15 weeks, which provides a large number of hours spread over many months. If you have not taken care of your educational process during this time, you have only yourself to blame. Discovering a few weeks before the end of the semester that you have not familiarized yourself with the guidelines will not be grounds for an appeal. The responsibility for keeping track of the course requirements lies with the student.

Your Opinion is Important

In the middle of the semester, we will provide a short, anonymous survey. We want to know your opinions on the course structure, materials, and the use of tools. Your suggestions will help us continuously improve this course.

FAQ (Frequently Asked Questions)

1. Can I use AI while learning and solving problems? Yes! Using AI is not only allowed but even recommended as a tool to support learning. However, it is important that you independently understand and can explain the solutions you get with AI and use it to deepen your knowledge, not just to get ready-made answers.

Use AI to:

- Explain difficult concepts.
- Get hints when you get stuck.
- Verify your own line of thinking.
- Generate examples and exercises for independent practice.
- Create quizzes/tests to check your own knowledge.

2. What if I don't understand a topic or have difficulties with the material? If you encounter difficulties, plan a session with AI to get additional explanations. Remember that actively seeking help on your own is part of the learning process. Nowadays, you have many tools at your disposal that can help you. There is no possibility of trying to excuse yourself with a lack of understanding of the material. AI is available 24/7, can adapt to your learning pace, and uses natural language, so asking questions is as easy as asking a classmate or the instructor.

3. The classes are in English. Can I study in my native language? Absolutely, and it's even recommended! The key to success is understanding the **ideas and concepts**, which is easiest to achieve in your native language. Once you understand the basics, switch to English to master the terminology and practice communication in the language of instruction. AI tools are perfect for this – you can ask for explanations in any language and then switch between them.

4. What are the consequences of not taking any of the colloquia? Missing any of the colloquia results in failing the entire course, regardless of the results of the other colloquia. The colloquia are a key element in assessing your understanding of the material. The long window for completing the test (at least 48 hours) gives you flexibility but does not relieve you of the obligation to prepare for and take each one.

Failing any colloquium makes it impossible to pass the exercises, which is a necessary condition to be eligible for the final exam. In practice, this means you cannot pass the subject in the given semester.

5. I was unable to take the colloquium due to a late visa or illness. What then? Unforeseen circumstances, such as a delayed visa or illness (hospitalization!), must be documented with official papers.

The colloquia will be online tests on the MS Teams platform using MS FORMS with a long time window (at least 48 hours) for their completion.

A situation where you started the test 5 minutes before the deadline and did not manage to finish it is not treated as an unforeseen circumstance. This is your responsibility and does not constitute grounds for an appeal. Just like being late for a plane – once the gate is closed, there is no way to board.

6. Why is the maximum grade from successfully, and even very well, completed colloquia only 3.0? The maximum grade from the colloquia has been set at 3.0 because they are only intended to check a basic understanding of the material. Online tests, with all the tools available today, do not allow for a full assessment of understanding and critical thinking skills. A grade of 3.0 only confirms that you are technically able to manage and complete the test within the allotted time.

Do you want to get a grade higher than 3.0? Absolutely no problem! You just have to demonstrate your understanding of the material during an oral interview, where you will have to explain your reasoning and defend your answers.

7. How should I prepare for the oral exam for a grade higher than 3.0? To effectively prepare for the exam interview, it's good to know what to expect.

Interview Structure:

- The interview will start by discussing a topic you have chosen from your learning process archive. This will be the starting point for a deeper discussion.
- Then I will ask 2-3 questions to verify your general understanding of the key concepts from the whole course.

What questions might be asked?

- **Conceptual questions:** *e.g., "Please explain what a basis of a vector space is and why it is an important concept."*
- **Problem-solving questions:** *e.g., "How would the solution to this problem change if we removed one of the assumptions?"*
- **Questions about your learning process (metacognitive):** *e.g., "Analyzing your conversation with AI about limits, what was the most difficult part for you and how did you finally understand it?"*

How to prepare? * **Deep understanding of the material:** Work on understanding concepts, not just memorizing facts. * **Argumentation practice:** Practice explaining key concepts and solution steps out loud, as if you were explaining them to someone else. A good practice is to write out your arguments in AI chatbots, which can help check the clarity and logic of your reasoning! * **Independent problem-solving:** Try to solve a variety of problems to be prepared for different types of questions. A pen and paper are your friends! You can always take a photo of your notes and send it to AI for extra hints. * **Simulations with AI:** Use AI to simulate an interview. Ask it to pose questions on a specific topic and evaluate your answers. * **Documentation of your work:** Keep organized notes from your interactions with AI and the completed guides. They will be a valuable resource for review.

Treat this course as training in critical thinking and problem-solving. The skills you gain here will extend far beyond mathematics itself. Notice that we are setting challenges for you that require active engagement and independent thinking. You will encounter analogous situations in your professional life, where you won't always have ready-made answers, and the ability to solve problems independently will be key. Solving a problem is always the first step; it is always followed by presenting it and defending

your position. These two elements are inseparable and always go hand in hand. The inability to defend your position, even if the solution is correct, may result in the rejection of your proposal.

Additional Confirmation

To formally confirm that you have read and accepted the course rules and conditions, every student is required to fill out a short form in MS Forms. The condition for being admitted to the course is to answer "YES" to each of the following questions.

1. Have you read the rules of participation and the course syllabus?
2. Do you understand that your active role in the learning process is crucial for passing the course?
3. Are you aware that failing to pass any of the colloquia will result in failing the course?
4. Do you understand that to obtain a grade higher than 3.0, you must demonstrate a deep understanding of the material during an oral interview?
5. Do you understand that as instructors, we are available ONLY during class hours and consultations?