**PJSC "Higher Educational Institution**
**"INTERREGIONAL ACADEMY OF PERSONNEL MANAGEMENT"**

МАУП

# SYLLABUS
*of the academic discipline*

# HIGHER MATHEMATICS

**Level of higher education:** first (bachelor's) level

**Field of knowledge:** D Business, Administration and Law

**Specialty:** D3 Management

**Study program:** Management

IAPM 2025

## General information about the academic discipline

| | |
|---|---|
| Name of the academic discipline | Higher mathematics |
| Code and name of the specialty | D3 Management |
| Level of higher education | First (bachelor's) level |
| Discipline status | Compulsory |
| Number of credits and hours | 4 credits/120 hours<br>Lectures: 26 hours<br>Seminars/practical classes: 26 hours<br>Students' independent work: 68 hours |
| Terms of study of the discipline | 1 semester |
| Language of instruction | Ukrainian |
| Final control type | Pass/fail (credit) |

## General information about the instructor. Contact information.

| | |
|---|---|
| Full name of the instructor | |
| Academic degree | |
| Position | |
| Areas of scientific research | |
| Links to the registers of identifiers for scientists | |
| Contact information | |
| E-mail: | |
| Department phone | |
| Instructor's portfolio on the website | |

**Discipline's description.**

The course provides knowledge of linear algebra, analytical geometry, and mathematical analysis (differential and integral calculus, differential equations, and series); it allows students to gain practical skills in solving matrix equations, systems of linear algebraic equations, analytical modeling of simple geometric figures, application of integral and differential calculus in the analysis of functional dependence, solving differential equations and applying series, and using mathematical methods in economics.

**The subject of the discipline** is mathematical methods of higher mathematics used in solving professional problems inherent in economic and managerial activities. Mastering the theoretical foundations of the course requires knowledge acquired in the study of arithmetic, algebra, and geometry in the secondary school curriculum.

**The aim of the discipline** is to provide future specialists with the theoretical foundations and practical skills in higher mathematics and the effective use of higher mathematics in their future activities.

**The objectives of the discipline**:

1. To master the basic principles and theoretical provisions of linear algebra, analytical geometry, and mathematical analysis;
2. To master the generally accepted norms for the use of mathematical symbols in scientific literature;
3. To master methods of formal transformations for solving analytical models of physical, economic, and social objects;
4. To acquire practical skills in solving formal problems in linear algebra, analytical geometry, and mathematical analysis.

**Prerequisites for the discipline:**
"Mathematics" at the standard level of general education institutions.

**Post-requisites for the discipline:**
Professional disciplines of the educational and professional program of the specialty.

## Program competences

| | |
|---|---|
| **General competencies** | GC3. Ability for abstract thinking, analysis, and synthesis.<br>GC4. Ability to apply knowledge in practical situations. |
| **Intended Learning Outcomes** | ILO17. Conduct research individually and/or in a group under the supervision of a leader. |

## Content of the academic discipline

| № | Topics | Number of hours, of which : | | | |
|---|---|---|---|---|---|
| | | **Lectures** | **Seminars** | **Independent work** | **Teaching methods /assessment methods** |
| **1st semester**<br>**Content module 1. Linear algebra and analytical geometry. Introduction to mathematical analysis and differential calculus.** | | | | | **Teaching methods** The main types of classroom activities are lectures, practical classes, and consultations. |

| | | | | |
|---|---|---|---|---|
| Topic 1. | Elements of matrix theory and determinants | 2 | 2 | 4 |
| Topic 2. | General theory of systems of linear algebraic equations. | 2 | 2 | 6 |
| Topic 3. | Elements of matrix analysis. | 2 | 2 | 6 |
| Topic 4. | Elements of vector algebra and analytical geometry | 2 | 2 | 6 |
| **Content module 2. Introduction to mathematical analysis and differential calculus** | | | | |
| Topic 5. | Elements of limit theory | 2 | 2 | 6 |
| Topic 6. | Differential calculus of functions of one variable | 2 | 2 | 6 |
| Topic 7. | Investigation of functions and construction of their graphs | 2 | 2 | 6 |
| Topic 8. | Basic concepts of functions of several variables and their interpretation in economic theory | 2 | 2 | 4 |
| Topic 9. | Differentiability of functions of several variables. Extremum and conditional extremum of functions of several variables. | 2 | 2 | 6 |
| Topic 10. | Series and their application. | 2 | 2 | 4 |
| **Content module 3. Integral calculus, differential equations** | | | | |
| Topic 11. | Integral calculus. | 2 | 2 | 6 |
| Topic 12. | Economic dynamics and its modeling: differential and difference equations | 2 | 2 | 4 |
| Topic 13. | Elements of financial mathematics and mathematical economics. | 2 | 2 | 4 |
| Modular test | | | | |
| **Total :** | | **26** | **26** | **68** |

When teaching lecture material, a combination of teaching forms and methods such as lecture-discussions and lecture-visualizations is provided.

***A lecture-discussion*** provides direct contact between the teacher and the audience and allows you to focus your attention on the most important issues of the lecture topic and identify the peculiarities of the perception of the educational material in the process of dialogue. You have the opportunity to reflect on the questions asked, self-assess your level of preparation, and learn to formulate conclusions and generalizations independently.

***A lecture-visualization*** involves the visual presentation of lecture material using technical teaching aids. Such a lecture consists of the teacher providing detailed or brief commentary on the visual materials being viewed.

During **practical classes**, students are expected to examine in detail certain theoretical provisions of the academic discipline with the teacher and develop the skills and abilities to apply them in practice by individually completing the tasks set and solving situational problems.

**Assessment methods**: oral assessment (oral questioning, assessment of participation in discussions, other interactive teaching methods); written assessment (tests, independent work, essays); test control (closed-form tests: alternative tests, matching tests); self-

| | |
|---|---|
| **Final assessment: pass/fail (credit)** | control and self-assessment method; assessment of case studies. |

**Technical equipment and/or software** – official website of IAPM:

http://IAPM.com.ua The educational process involves the use of classrooms, a library, a multimedia projector, and a computer for conducting lectures and seminars with presentation elements. Studying individual topics and completing practical tasks requires access to internet resources, which is provided through a free Wi-Fi network.

**Forms and methods of assessment.**

Assessment of students' academic performance is divided into ongoing and final (semester) assessment.

Ongoing assessment is conducted during practical (seminar) classes and is aimed at systematically checking the understanding and assimilation of theoretical material, as well as the ability to apply theoretical knowledge when completing practical tasks. The possibilities of ongoing assessment are extensive: it can support learning motivation, stimulate educational and cognitive activity, enable a differentiated approach to teaching, and ensure individualization of the learning process.

Forms of student participation in the educational process subject to ongoing assessment include:

- oral reports;
- comments and questions to the speaker;
- consistent performance in seminar classes and active participation in discussions;
- participation in debates and interactive learning activities;
- analysis of legislation and academic literature;
- written assignments (tests, quizzes, creative tasks, essays, etc.);
- preparation of theses and summaries of academic or scientific texts;
- independent study of course topics.

**Methods of ongoing assessment include:** oral assessment (interview, discussion, report, presentation, etc.); written assessment (tests, essays, written presentations on assigned topics, etc.); combined assessment; presentation of independent work; observation as a method of assessment; testing; analysis of problem situations.

Grading system and requirements.
Table of distribution of points received by students

| | Ongoing knowledge assessment | Module assessment task | Pass /Fail | Total points |
|---|---|---|---|---|

| Topics | Topic 1 | Topic 2 | Topic 3 | Topic 4 | Topic 5 | Topic 6 | Topic 7 | Topic 8 | Topic 9 | Topic 10 | Topic 11 | Topic 12 | Topic 13 | 20 | 20 | 100 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Work in a seminar | 4 | 4 | 4 | 4 | 3 | 4 | 3 | 4 | 3 | 4 | 3 | 4 | 3 | | | |
| Independent work | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | | | |

The table contains information about the maximum points for each type of assignment.

When assessing the mastery of each topic within ongoing educational activities, students receive marks in accordance with the approved assessment criteria for the respective discipline.

The criteria for evaluating learning outcomes and the distribution of points are regulated by the Regulations on the Assessment of Students' Academic Achievements at PJSC "HEI IAPM".

**Modular assessment.** Modular assessment in the discipline "Higher mathematics" is conducted in written form as testing using closed-type test items, including alternative and matching formats.

Criteria for evaluating the modular test in the academic discipline "Higher mathematics":

When evaluating the modular test, the volume and correctness of the completed tasks are taken into account:

- the grade "excellent" (A) is given for the correct completion of all tasks (or more than 90% of all tasks);
- the grade "good" (B) is given for the completion of 80% of all tasks;
- the grade "good" (C) is given for the completion of 70% of all tasks;
- the grade "satisfactory" (D) is given if 60% of the proposed tasks are completed correctly;
- the grade "satisfactory" (E) is given if more than 50% of the proposed tasks are completed correctly;
- the grade "unsatisfactory" (FX) is given if less than 50% of the tasks are completed.

Absence from the modular test work - 0 points.

The above grades are transformed into rating points as follows:

"A" - 18-20 points;

"B" - 16-17 points;

"C" - 14-15 points;
"D" - 12-13 points.
"E" - 10-11 points;
"FX" - less than 10 points.

The final semester assessment in the discipline “Higher mathematics” is a mandatory form of evaluating student learning outcomes. It is conducted within the time frame defined by the academic schedule and covers the scope of material specified in the course program.

The final assessment is administered in the form of a test. A student is admitted to the semester assessment only upon completion of all required coursework.

The final grade is assigned based on the student’s performance throughout the semester. The student’s rating score consists of the points accumulated through ongoing assessment activities and incentive points.

Students who have completed all required tasks and achieved a rating score of 60 points or higher receive a grade corresponding to the obtained rating without additional testing.

For students who have completed all required tasks but have a rating score below 60 points, as well as for those who wish to improve their score, the instructor conducts a final semester assessment in the form of a test during the last scheduled class of the discipline in the semester.

**Assessment of additional (individual) types of educational activities.** Additional (individual) types of educational activity include student participation in scientific conferences, research societies and problem groups, preparation of publications, and other activities beyond the tasks defined in the syllabus of the academic discipline.

By decision of the department, students who engage in research work or complete certain types of additional (individual) educational activities may receive incentive (bonus) points for a specific educational component.

Incentive points are not mandatory and are not included in the standard point distribution table or the main assessment scale.

A single event may serve as the basis for awarding incentive points for only one educational component – the one to which it is most relevant.

**Assessment of independent work**

The total number of points earned by a student for completing independent work is one of the components of academic performance in the discipline. Independent work for each topic, in accordance with the course program, is evaluated within the range of 0 to 1 points using standardized and generalized knowledge assessment criteria.

Scale for evaluating the performance of independent work (individual tasks)

| The maximum possible assessment of independent work | Execution level | | | |
|---|---|---|---|---|
| | Excellent | Good | Satisfactory | Unsatisfactory |

| | | | | |
|---|---|---|---|---|
| (individual tasks) | | | | |
| 1 | 1 | 0,75 | 0,5 | 0 |

Forms of assessment include: ongoing assessment of practical work; ongoing assessment of knowledge acquisition based on oral responses, reports, presentations, and other forms of participation during practical (seminar) classes; individual or group projects requiring the development of practical skills and competencies (optional format); solving situational tasks; preparation of summaries on independently studied topics; testing or written examinations; preparation of draft articles, conference abstracts, and other publications; other forms that ensure comprehensive assimilation of the study program and contribute to the gradual development of skills for effective independent professional (practical, scientific, and theoretical) activity at a high level.

To assess the learning outcomes of a student during the semester, a 100-point, national and ECTS assessment scale is used

Summary assessment scale: national and ECTS

| Total points for all types of learning activities | ECTS assessment | National scale assessment for exam, course project (work), internship | |
|---|---|---|---|
| | | National scale assessment for exam, course project (work), internship | For pass/fail (credit) |
| 90 – 100 | A | excellent | pass |
| 82 – 89 | B | good | |
| 75 – 81 | C | | |
| 68 – 74 | D | satisfactory | |
| 60 – 67 | E | | |
| 35 – 59 | FX | unsatisfactory with the possibility of retaking | fail<br><br>unsatisfactory with the possibility of retaking |
| 0 – 34 | F | unsatisfactory with mandatory re-study of the discipline | fail<br><br>unsatisfactory with mandatory re-study of the discipline |

**Discipline's Policy:**
- regularly attend lectures and practical classes;
- work systematically and actively in lectures and practical classes;
- catch-up on missed classes;

- perform the tasks required by the syllabus in full and with appropriate quality;
- perform control and other independent work;
- adhere to the norms of academic behaviour and ethics.

The discipline “Higher mathematics” requires adherence to the principles of ethics and academic integrity, with particular emphasis on preventing plagiarism in all its forms. All written assignments, reports, essays, abstracts, and presentations must be original, authored by the student, and not overloaded with quotations, which must be accompanied by references to primary sources. Violations of academic integrity include academic plagiarism, self-plagiarism, fabrication, falsification, copying, deception, bribery, and biased evaluation.

Student assessment is based on participation and activity in seminar/practical classes, completion of independent work tasks, and performance of assignments aimed at developing practical skills and competencies. Additional (bonus) points may be awarded for activities such as participation in round-table discussions, scientific conferences, or student research competitions.

**Methodological support of the academic discipline**

Teaching and methodological support for the discipline includes lecture notes, methodological guidelines for conducting practical (seminar) classes, and methodological recommendations for students’ independent work in the academic discipline “Higher mathematics”.

**Recommended sources of information:**

**Basic literature:**

1. Barkovsky, V. V., Barkovska, T. V. Higher Mathematics for Economists: Textbook. Kyiv: TUL, 2019. 456 p.
2. Higher Mathematics in Applied Economic Problems (Part 1. Financial Mathematics, Linear and Vector Algebra, Analytical Geometry): Textbook for Students of Economic Specialties in All Forms of Education / Compiled by: Blashchak N. I., Tsymbaliuk L. I., Boiko A. R. Ternopil: Ivan Pul'uj Ternopil National Technical University, 2020. 100 p.
3. Kovalenko L. B. Higher Mathematics for Managers: Textbook / 2nd ed., rev. Kharkiv: O. M. Beketov National University of Water and Environmental Engineering, 2019. 341 p.
4. Liman F., Vlasenko V., Petrenko S. Higher Mathematics: Textbook. Sumy: University Book, 2018, 608 p.
5. Matsukul V. M. Mathematics for Economists: Textbook. Odessa: ONEU, 2018. 472 p.
6. Teaching and Methodological Manual for the Course “Higher Mathematics”: compiled by O.G. Semenko. Pereyaslav-Khmelnytskyi: PHDPU, 2021. 260 p.
7. Pasichnyk, Y. A. Higher Mathematics: Textbook. Ostroh: Publishing House of the National University “Ostrog Academy,” 2021. 432 p.

**Additional literature*:***


1. Ovchinnikova N.P. Methodological guidelines for independent work in the discipline “Higher Mathematics” (section “Application of the definite integral”) for students of the field of knowledge 07 “Management and Administration” of the correspondence form of training. Dnipro: Dnipro State Academy of Architecture and Construction, 2018. 14 p.
2. Tychynin V.A., Dolgova I.M. Higher Mathematics. Methodological guidelines for studying the theoretical course. Definite integral. (for students of all specialties). Dnipropetrovsk: Dnipro State Academy of Architecture and Construction, 2020. 24 p.
3. Chumak L.O. Methodological guidelines for independent work in the discipline “Higher Mathematics” (section “Indefinite Integral”) for bachelor's degree students of all specialties of full-time education. Dnipro: Dnipro State Academy of Architecture and Construction, 2021. 32 p.
4. Chumak L.O. Methodological guidelines for independent work in the discipline “Mathematics for Economists” (section “Algebra”) for bachelor's degree students of economic specialties of full-time and part-time forms of study. Dnipro: PDABA, 2021. 34 p.
5. Chumak L.O. Methodological guidelines for independent work in the discipline “Mathematics for Economists” (section “Mathematical Analysis”) for bachelor's degree students in economics, full-time and part-time forms of study. Dnipro: PDABA, 2021. 36 p.
6. Chumak L.O. Methodological guidelines for independent work in the discipline “Mathematics for Economists” (section “Differential Calculus”) for applicants for the first (bachelor's) level of higher education in economics, full-time and part-time forms of study. Dnipro: PDABA, 2023. 27 p.
7. Chumak L.O. Methodological guidelines for completing a test in the discipline “Mathematics for Economists” for applicants for the first (bachelor's) level of higher education in economic specialties in part-time forms of study / Compiled by: Chumak L.O. Dnipro: PDABA, 2023. 31 p.


**Information resources:**

1. Library of the Kharkiv Institute of MAUP
2. Kharkiv State Scientific Library named after V.G. Korolenko, 18 Korolenko Lane. E-mail: LS@ korolenko.kharkov.com . http://korolenko.kharkov.com
3. Kharkiv Regional Universal Scientific Library, 13/2 Kooperativna St. E-mail: director@ library.kharkov.ua . http://www.library.kharkov
4. Virtual reading room of the PDABA: http://library.pgasa.dp.ua
5. Learning mathematics online: https://matem.com.ua
6. Studying mathematics online: http://ua.onlinemschool.com/matematyka.html
7. Higher mathematics: http://yukhym.com/uk/navchannia/vyshcha-matematyka.html