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| <b>Identification</b>                          | <b>Subject (code, title, credits)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | <b>MATH 225 Business Mathematics – 6 ECTS</b> |
|                                                | <b>Department</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Mathematics                                   |
|                                                | <b>Program</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Undergraduate                                 |
|                                                | <b>Term</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Fall, 2025                                    |
|                                                | <b>Instructor</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Yetar Ferhadova                               |
|                                                | <b>E-mail:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | yeter.ferhadova2@gmail.com                    |
|                                                | <b>Classroom/hours</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Wednesday 15:20-16:50, 17:00-18:30            |
|                                                | <b>Office hours</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                               |
| <b>Prerequisites</b>                           | -                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                               |
| <b>Language</b>                                | English                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                               |
| <b>Compulsory/Elective</b>                     | Compulsory                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                               |
| <b>Required textbooks and course materials</b> | <p>[1] George B. Thomas', Calculus 13th edition. 2014, 536 p.</p> <p>[2] Linear Algebra and Its applications David C. Lay 6th Edition, Pearson, 2021</p> <p>Additional materials:</p> <ol style="list-style-type: none"> <li>1. James Stewart. Calculus (8<sup>th</sup> edition.). Brooks Cole, 2015, 1368 p.</li> <li>2. Ron Larson and Bruce Edwards. Calculus (10<sup>th</sup> edition). Cengage Learning, 2013, 1280 p.</li> <li>3. Introduction to Linear Algebra, 6th Edition. Gilbert Strang, 2021.</li> <li>4. "Calculus: A Complete Course" by Robert Adams and Christopher Essex, 10th Edition, 2021.</li> </ol>                                                                                                                                                                                          |                                               |
| <b>Course outline</b>                          | <p>This course explores the application of mathematical reasoning and quantitative techniques to business, management, and economic decision-making. Students will begin with the study of algebraic and transcendental functions, limits, and differentiation, followed by real-world applications such as marginal analysis, elasticity, and optimization. The second half of the course focuses on linear algebra, emphasizing systems of equations, matrices, determinants, and their use in business models, forecasting, and economic planning. Practical problem-solving, case-based examples, and business-oriented modeling are integrated throughout the semester to develop both theoretical understanding and applied skills. Numerous applications of mathematics are given throughout the course.</p> |                                               |
| <b>Course objectives</b>                       | <p>This course aims to:</p> <ul style="list-style-type: none"> <li>• Introduce students to fundamental concepts of calculus and linear algebra with a strong emphasis on business applications.</li> <li>• Equip students with analytical tools for understanding and solving real-world business and economic problems.</li> <li>• Build competence in using mathematical models to support decision-making in finance, management, and economics.</li> </ul>                                                                                                                                                                                                                                                                                                                                                      |                                               |

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| <b>Learning outcomes</b> | <p>Students successfully completing this course should be able to</p> <ul style="list-style-type: none"> <li>Identify and represent business problems using mathematical models.</li> <li>Apply calculus concepts (limits, derivatives, optimization) to analyze costs, revenues, and demand functions.</li> <li>Use matrix methods and determinants to solve business-related systems of equations.</li> <li>Apply linear algebra techniques to input–output analysis and resource allocation problems.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                       |                       |
| <b>Teaching methods</b>  | <b>Lecture</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                       | x                     |
|                          | <b>Group discussion</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                       | x                     |
|                          | <b>Problem Solving</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                       | x                     |
|                          | <b>Homework assignments</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                       | x                     |
|                          | <b>Simulation</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                       |                       |
|                          | <b>Course paper</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                       |                       |
|                          | <b>Others</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                       |                       |
| <b>Evaluation</b>        | <b>Methods</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | <b>Date/deadlines</b> | <b>Percentage (%)</b> |
|                          | <b>Midterm Exam</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                       | 30                    |
|                          | <b>Case studies</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                       |                       |
|                          | <b>Class attendance</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                       | 5                     |
|                          | <b>Class activity</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                       | 5                     |
|                          | <b>Quizzes (2 quizzes with equal weight)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                       | 20 (4 quizzes)        |
|                          | <b>Final Exam</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                       | 40                    |
|                          | <b>Others</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                       |                       |
|                          | <b>Total</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                       | 100                   |
| <b>Policy</b>            | <p><b>Attendance and activity</b><br/> The students are required to attend all classes as part of their studies and those having legitimate reasons for absence (illness, family bereavement etc.) are required to inform the instructor.<br/> However, this student is able to enter the second double hours without delaying. The attendance and participation will account for 5% of the total course grade, which depends on students' good class attendance and active participation in class discussions.</p> <p><b>Withdrawal (pass/fail)</b><br/> This course strictly follows grading policy of the School of Economics and Management. Thus, a student is normally expected to achieve a mark of at least 60% to pass. In case of failure, he/she will be referred or required to repeat the course the following term or year. For referral, the student will be required to take examination scheduled by instructor.</p> <p><b>Assignments/quizzes</b><br/> The overall course will consist of 4 quizzes, two of them before midterm exam and the two after midterm exam. Total score for all quizzes is 20% with 5% for each.</p> <p><b>Cheating/plagiarism</b><br/> Cheating or other plagiarism during the Quizzes, Midterm and Final Examination will lead to paper cancellation. In this case, the student will automatically get zero (0), without any considerations.</p> |                       |                       |

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|                           |                                 | <b>Professional behavior guidelines</b><br>The students shall behave in the way to create favorable academic and professional environment during the class hours. Unauthorized discussions and unethical behavior are strictly prohibited. |                             |
| <b>Tentative Schedule</b> |                                 |                                                                                                                                                                                                                                            |                             |
| <b>Week</b>               | <b>Date/Day<br/>(tentative)</b> | <b>Topics</b>                                                                                                                                                                                                                              | <b>Textbook/Assignments</b> |
| 1                         | 17.09.2025<br>17.09.2025        | Functions and their graphs. Combining functions: Shifting and Scaling Graphs. Trigonometric functions. Exponential functions. Inverse functions and logarithms.                                                                            | 1.1-1.6 [1]                 |
| 2                         | 24.09.2025<br>24.09.2025        | Limit of function and limit laws. One-Sided limits. Limits involving infinity; Asymptotes of graphs.                                                                                                                                       | 2.2-2.4, 2.6 [1]            |
| 3                         | 01.10.2025<br>01.10.2025        | Tangents and the derivative at a point. The derivative as a function. Differentiation rules.                                                                                                                                               | 3.1-3.3[1]                  |
| 4                         | 08.10.2025<br>08.10.2025        | The derivative as a rate of change. Derivatives of trigonometric functions. The chain rule.<br><b>QUIZ 1 (5pts.)</b>                                                                                                                       | 3.4-3.6 [1]                 |
| 5                         | 15.10.2025<br>15.10.2025        | Implicit differentiation.<br>Derivatives of Inverse functions and logarithms.                                                                                                                                                              | 3.7-3.8 [1]                 |
| 6                         | 22.10.2025<br>22.10.2025        | Inverse trigonometric functions. Related Rates. Linearization and differentials.                                                                                                                                                           | 3.9-3.11 [1]                |
| 7                         | 29.10.2025<br>29.10.2025        | Applications of derivatives. Extreme values of functions. The mean value theorem.                                                                                                                                                          | 4.1-4.2 [1]                 |
| 8                         | 05.11.2025<br>05.11.2025        | Monotonic functions and the first derivative test. Concavity and curve sketching.                                                                                                                                                          | 4.3-4.4 [1]                 |
| 9                         | 12.11.2025<br>12.11.2025        | Indeterminate forms and L’Hopital’s rule. Applied optimization. Newton’s method. Antiderivatives.<br><b>QUIZ 2 (5pts.)</b>                                                                                                                 | 4.5-4.8 [1]                 |
| 10                        | 19.11.2025<br>19.11.2025        | Linear models in Economics. Systems of linear equations. Row reduction and echelon forms. Vector equations.<br><b>Midterm exam</b>                                                                                                         | 1.1-1.3 [2]                 |
| 11                        | 26.11.2025<br>26.11.2025        | The matrix equation $Ax=b$ . Solution sets of Linear systems. Applications of linear systems. Linear independence.                                                                                                                         | 1.4-1.7[2]                  |
| 12                        | 03.12.2025<br>03.12.2025        | Introduction to linear transformations. The matrix of a linear transformation. Linear models in business, science, and engineering. <b>QUIZ 3 (5pts.)</b>                                                                                  | 1.8-1.10[2]                 |
| 13                        | 10.12.2025<br>10.12.2025        | Computer models in aircraft design. Matrix operations. The inverse of a matrix.                                                                                                                                                            | 2.1-2.2[2]                  |
| 14                        | 17.12.2025<br>17.12.2025        | Characterizations of invertible matrices. Partitioned matrices. Matrix Factorizations. The Leontief input-output model.                                                                                                                    | 2.3-2.6 [2]                 |

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| 15 | 24.12.2025<br>24.12.2025 | Introduction to determinants. Properties of determinants. Cramer's rule, volume, and linear transformations<br><b>QUIZ 4 (5pts.)</b> | 3.1-3.3 [2] |
|    | <b>TBA</b>               | <b>Final exam</b>                                                                                                                    |             |

This syllabus is a guide for the course and any modifications to it will be announced in advance.

