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|------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|
| <b>Identification</b>                          | <b>Subject</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | MATH101, Calculus I B, 6 ECTS    |
|                                                | <b>Department</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Mathematics                      |
|                                                | <b>Program</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Undergraduate                    |
|                                                | <b>Term</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Fall, 2025                       |
|                                                | <b>Instructor</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Gulnar Akhundova                 |
|                                                | <b>E-mail:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | akhundoff86@gmail.com            |
|                                                | <b>Phone:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                  |
|                                                | <b>Classroom/hours</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Friday: 11:50-13:20, 13:40-15:10 |
| <b>Prerequisites</b>                           | The prerequisites are high school algebra and trigonometry. Prior experience with calculus is helpful but not necessary.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                  |
| <b>Language</b>                                | English                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                  |
| <b>Compulsory/Elective</b>                     | Required                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                  |
| <b>Required textbooks and course materials</b> | <p><b><i>Core Textbooks:</i></b></p> <ol style="list-style-type: none"> <li>George Thomas, et al, Thomas' Calculus: Early Transcendental, 12th edition, Addison-Wesley (2010), (<a href="http://libgen.org/">http://libgen.org/</a>)</li> </ol> <p><b><i>Supplementary book</i></b></p> <ol style="list-style-type: none"> <li>James Stewart, Essential calculus. Early transcendentals, Second Edition, Brooks/Cole (2013) (<a href="http://libgen.org/">http://libgen.org/</a>)</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                  |
| <b>Course outline</b>                          | <p>Calculus is a transition course to upper-division mathematics and computer science courses. Students will extend their experience with functions as they study the fundamental concepts of calculus: limiting behaviors, difference quotients and the derivative, Riemann sums and the definite integral, antiderivatives and indefinite integrals, and the Fundamental Theorem of Calculus. Students review and extend their knowledge of trigonometry and basic analytic geometry. Important objectives of the calculus sequence are to develop and strengthen the students' problem-solving skills and to teach them to read, write, speak, and think in the language of mathematics. In particular, students learn how to apply the tools of calculus to a variety of problem situations. Calculus plays an important role in the understanding of science, engineering, economics and computer science, among other disciplines. As it's mentioned this introductory calculus course covers differentiation and initial techniques of integration of functions of one variable, with applications. Topics include:</p> <ul style="list-style-type: none"> <li>• Concept of functions; trigonometric functions</li> <li>• Limits and continuity</li> <li>• Derivative; Differentiation rules</li> <li>• Applications of derivative to investigation of extremes and graphing</li> <li>• Antiderivative</li> </ul> |                                  |
| <b>Course objectives</b>                       | <ul style="list-style-type: none"> <li>• Limits and Continuity</li> <li>• Differentiations</li> <li>• Applications of Derivatives</li> <li>• Integration</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                  |
| <b>Learning outcomes</b>                       | By the end of the course the students should be able:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                  |

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|                         | <ul style="list-style-type: none"> <li>• To find one-sided limits of functions;</li> <li>• To find limit of functions at points and infinity;</li> <li>• To find derivative of functions;</li> <li>• To draw a graphs of nontrivial functions using limits and derivatives;</li> <li>• To show the connection between area and the definite integral;</li> <li>• To apply fundamental theorem of calculus to evaluate definite integral;</li> <li>• To apply differentiation and integration to solve real world problems.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                       |                       |
| <b>Teaching methods</b> | <b>Lecture</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                       | x                     |
|                         | <b>Group discussion</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                       | x                     |
|                         | <b>Experiential exercise</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                       | x                     |
|                         | <b>Simulation</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                       |                       |
|                         | <b>Case analysis</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                       |                       |
|                         | <b>Course paper</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                       | x                     |
|                         | <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 Participation</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                       | 5                     |
|                         | <b>Quizzes</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                       | 20(4 quizzes)         |
|                         | <b>Activity</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                       | 5                     |
|                         | <b>Laboratory work</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                       |                       |
|                         | <b>Final Exam</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                       | 40                    |
|                         | <b>Others</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                       |                       |
|                         | <b>Total</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                       | 100                   |
| <b>Policy</b>           | <p>▪ <b>Preparation for class</b><br/>The structure of this course makes your individual study and preparation outside the class extremely important. The lecture material will focus on the major points introduced in the text. Reading the assigned chapters and having some familiarity with them before class will greatly assist your understanding of the lecture. After the lecture, you should study your notes and work relevant problems and cases from the end of the chapter and sample exam questions.<br/>Throughout the semester we will also have a large number of review sessions. These review sessions will take place during the regularly scheduled class periods.</p> <p>▪ <b>Quizzes and examinations</b><br/>Quizzes may be given unannounced throughout the term. There will be no make-up quizzes.</p> <p>▪ <b>Withdrawal (pass/fail)</b><br/>This course strictly follows grading policy of the School of Science and Engineering. Thus, a student is normally expected to achieve a mark of at</p> |                       |                       |

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|  | <p>least 60% to pass. In case of failure, he/she will be required to repeat the course the following term or year.</p> <ul style="list-style-type: none"> <li>▪ <b>Cheating/plagiarism</b><br/>Cheating or other plagiarism during the Quizzes, Mid-term and Final Examinations will lead to paper cancellation. In this case, the student will automatically get zero (0), without any considerations.</li> <li>▪ <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.</li> <li>▪ <b>Ethic</b><br/>Use of any electronic devices is prohibited in the classroom. All devices should be turned off before entering class. This is a university policy and <u>violators will be reprimanded accordingly!</u></li> </ul> <p>Students should not arrive in late to class!</p> |
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| Tentative Schedule |                         |                                                                                                                                                       |                              |
|--------------------|-------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|
| Week               | Date/Day<br>(tentative) | Topics                                                                                                                                                | Textbook/<br>Assignments     |
| 1                  | 19.09.25<br>19.09.25    | <ul style="list-style-type: none"> <li>• Rates of Change and Tangents to Curves</li> <li>• Limit of a Function and Limit Laws</li> </ul>              | Ch.2.1, 2.2                  |
| 2                  | 26.09.25<br>26.09.25    | <ul style="list-style-type: none"> <li>• The Precise Definition of a Limit</li> <li>• Practice</li> </ul>                                             | Ch. 2.3                      |
| 3                  | 03.10.25<br>03.10.25    | <ul style="list-style-type: none"> <li>• One-Sided Limits</li> <li>• Continuity</li> </ul>                                                            | Ch. 2.4, 2.5                 |
| 4                  | 10.10.25<br>10.10.25    | <ul style="list-style-type: none"> <li>• Limits Involving Infinity; Asymptotes of Graphs</li> <li>• Tangents and the Derivative at a Point</li> </ul> | Ch. 2.6, 3.1,                |
| 5                  | 17.10.25<br>17.10.25    | <ul style="list-style-type: none"> <li>• The Derivative as a Function</li> <li>• Differentiation Rules</li> </ul>                                     | Ch. 3.2, 3.3<br>Quiz (5 pts) |
| 6                  | 24.10.25<br>24.10.25    | <ul style="list-style-type: none"> <li>• The Derivative as a Rate of Change</li> <li>• Derivatives of Trigonometric Functions.</li> </ul>             | Ch.3.4,3.5                   |
| 7                  | 31.10.25<br>31.10.25    | <ul style="list-style-type: none"> <li>• The Chain Rule</li> <li>• Implicit Differentiation</li> </ul>                                                | Ch. 3.6, 3.7<br>Quiz (5 pts) |
| 8                  | 07.11.25<br>07.11.25    | <ul style="list-style-type: none"> <li>• Derivatives of Inverse Functions and Logarithms</li> <li>• Practice</li> </ul>                               | Ch. 3.8                      |
| 9                  | 14.11.25<br>14.11.25    | <ul style="list-style-type: none"> <li>• <b>Midterm Exam</b></li> <li>• Inverse Trigonometric Functions, Related Rates</li> </ul>                     | Ch. 3.9, 3.10                |
| 10                 | 21.11.25<br>21.11.25    | <ul style="list-style-type: none"> <li>• Linearization and Differentials</li> <li>• Extreme Values of Functions</li> </ul>                            | Ch. 3.11, 4.1                |

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| 11 | 28.11.25<br>28.11.25 | <ul style="list-style-type: none"> <li>• The Mean Value Theorem</li> <li>• Monotonic Functions and the First Derivative Test</li> </ul>                 | <b>Ch.4.2,4.3<br/>Quiz (5 pts)</b>   |
| 12 | 05.12.25<br>05.12.25 | <ul style="list-style-type: none"> <li>• Concavity and Curve Sketching, Indeterminate Forms and L'Hôpital's Rule</li> <li>• Antiderivatives.</li> </ul> | <b>Ch. 4.4, 4.5,<br/>4.8</b>         |
| 13 | 12.12.25<br>12.12.25 | <ul style="list-style-type: none"> <li>• Area and Estimating with Finite Sums</li> <li>• Sigma Notation and Limits of Finite Sums</li> </ul>            | <b>Ch. 5.1,5.2</b>                   |
| 14 | 19.12.25<br>19.12.25 | <ul style="list-style-type: none"> <li>• The Definite Integral</li> <li>• The Fundamental Theorem of Calculus</li> </ul>                                | <b>Ch. 5.3, 5.4<br/>Quiz (5 pts)</b> |
| 15 | 26.12.25<br>26.12.25 | <ul style="list-style-type: none"> <li>• Indefinite Integrals and the Substitution Method</li> <li>• Substitution and Area Between Curves</li> </ul>    | <b>Ch. 5.5, 5.6</b>                  |
|    | <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.