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| | **Course name:** MATH 111 Calculus I | | | **Department:** Mathematics | | | Semester 1 | |
| | Methods of Education | | | | | | Credit (ECTS) | |
| | Lecture | Recitation/ (Etud) | Lab | Homework/ Quiz | Exams | Other | Total | 10 |
| | 56 | 28 | 0 | 30 | 75 | 112 | 301 | |
| Language | English | | | | | | | |
| Compulsory/Elective | Compulsory | | | | | | | |
| Prerequisites | None | | | | | | | |

Course Contents

| Week | Subjects |
|---|---|
| **1** | ▪ Real numbers, intervals, absolute value.<br>▪ Linear and quadratic functions, polynomials and rational functions, trigonometric functions, even and odd functions, exponential and logarithmic functions. |
| **2** | ▪ Limits of functions.<br>▪ One-sided limits, Rules for calculating limits, The squeeze theorem.<br>▪ Limits at infinity, infinite limits.<br>▪ Continuity at a point.<br>▪ Continuity on an interval, continuous functions.<br>▪ Intermediate value theorem. |
| **3** | ▪ The Formal Definition of Limit<br>▪ Using the definition of limit to prove theorems.<br>▪ Tangent lines, slopes, normal.<br>▪ Definition of the derivative, the derivative of a function. |
| **4** | ▪ Differentiation rules.<br>▪ The chain rule. |
| **5** | ▪ Derivatives of trigonometric functions.<br>▪ Higher-order derivatives |
| **6** | ▪ Using differentials and derivatives.<br>▪ The mean value theorem.<br>▪ Implicit differentiation. |
| **7** | ▪ Inverse functions.<br>▪ Exponential and logarithmic functions.<br>▪ The natural logarithm and exponential.<br>▪ Growth and decay. |
| **8** | ▪ The inverse trigonometric functions.<br>▪ Hyperbolic functions. |
| **9** | ▪ Related rates.<br>▪ Indeterminate forms, l'Hôpital's Rules |
| **10** | ▪ Extreme values.<br>▪ Classifying critical points, singular points and endpoints of the domain using first derivative test. |

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<tr><td>11</td><td>▪ Concavity and inflections.<br>▪ Second derivative test.<br>▪ Sketching the graph of a function<br>▪ Asymptotes.</td></tr>
<tr><td>12</td><td>▪ Extreme Value Problems.<br>▪ Linear approximations.<br>▪ Taylor polynomials, Taylor’s formula</td></tr>
<tr><td>13</td><td>▪ Sums and sigma notation, areas as limits of sums.<br>▪ Partitions and Riemann sums.<br>▪ Definite integral, properties of definite integral.<br>▪ Mean value theorem for integrals.</td></tr>
<tr><td>14</td><td>▪ Definite integrals of piecewise continuous functions.<br>▪ Fundamental theorem of calculus.</td></tr>
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<tr><td>Course Objectives</td><td>The purpose of this course is<br><br>• to provide a solid introduction to differential calculus in one variable,<br>• to give the basic knowledge on limits, continuity and differentiation and to use them in some real life problems.</td></tr>
<tr><td>Learning Outcomes and Competences</td><td>Upon completion of this course students will<br><br>• be able to compute basic limits,<br>• understand the limit, continuity and differentiation concepts,<br>• be able to obtain derivatives of functions in one variable,<br>• learn how to use differentiation to solve various type of problems and especially some real life problems.</td></tr>
<tr><td>Textbook and /or References</td><td>1) Adams, R. A. and Essex, C., Calculus a Complete Course, 9th edition Pearson,<br>2) Rogawski, J., Single Variable Calculus, 3rd edition W.H. Freeman & CO.</td></tr>
<tr><td>Assessment Criteria</td><td>
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<tr><td></td><td>If any, mark as (X)</td><td>Percentage (%)</td></tr>
<tr><td>Midterm Exams</td><td>X</td><td>35</td></tr>
<tr><td>Quizzes</td><td>X</td><td>5</td></tr>
<tr><td>Homework</td><td></td><td></td></tr>
<tr><td>Projects</td><td></td><td></td></tr>
<tr><td>Term Paper</td><td></td><td></td></tr>
<tr><td>Laboratory work</td><td></td><td></td></tr>
<tr><td>Other</td><td></td><td></td></tr>
<tr><td>Final Exam</td><td>X</td><td>60</td></tr>
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<tr><td>Instructors</td><td></td></tr>
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