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| Course Title | Calculus and Analytic Geometry I | | | | |
| Course Code | AMAT111 | | | | |
| Course Type | Required | | | | |
| Level | BSc (Level 1) | | | | |
| Year / Semester | 1st Year /1st Semester | | | | |
| Teacher's Name | Dr. Eleni Tsolaki | | | | |
| ECTS | 5 | Lectures / week | 3 | Laboratories/week | |
| Course Purpose | The purpose of the course is to introduce students with mathematics concepts that are considered essential for engineering studies in general. We begin the class by defining important functions and concepts in mathematics that arise in engineering and we study their properties and behavior. We introduce the notion of the derivative of a function, explain its importance and make a detailed study of the topic. As a result we are able to make our first tangible connection between mathematics and engineering practice in the search for maximum and minimum values. | | | | |
| Learning Outcomes | • Explain the notion of a function of a real variable. Sketch the graph of linear, quadratic, and cubic functions.<br>• Define the Logarithm of a positive real number, state the properties of Logarithms, and solve Logarithmic equations.<br>• Define, sketch the graph, and describe the properties of the exponential function, the logarithmic function and the basic trigonometric functions.<br>• Define the basic trigonometric functions and sketch their graphs. State and use fundamental trigonometric identities. Use basic identities of trigonometric functions of sums and differences of two angles. Use the unit circle to find values of trigonometric function for angels not on the first and second quadrant.<br>• Explain the notion of limits and continuity of functions, identify and verify limits and points of discontinuity from a graph.<br>• Describe the derivative as a limit of finite differences, find the derivative of specific categories of functions, state and apply the general rules of differentiation to calculate derivatives, use the first and second derivative of a function to find its local extrema, points of inflection, and regions in which it is increasing, decreasing, concaving upwards or downwards.<br>• Apply the knowledge of derivatives in the field of engineering and in optimization problems.<br>• Explain in broad terms the concept of the integral of a function of a real variable. Basic integration formulas. The definite integral. | | | | |

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| Prerequisites | AMAT100 or passing grade in the mathematics placement test. | Corequisites | None |
| Course Content | • Exponents, roots and their properties. The concept of the logarithm and its properties. Exponential and logarithmic equations.<br>• Basic trigonometric functions and their graphs (sinx, cosx, tanx, cotx, secx, cscx). The unite circle. Basic identities of trigonometric functions including trigonometric functions of sums and differences of two angles.<br>• Real valued functions of one variable: functions, operations of functions, inverse functions, logarithmic and exponential functions and their properties. Graphs of linear, quadratic, cubic, square root, exponential and logarithmic functions.<br>• Limits and continuity: introduction to calculus, limits, and continuity.<br>• Differentiation: The derivative as a function, the derivative as a rate of change and as the slope of a graph, techniques of differentiation, chain rule, derivatives of trigonometric, exponential, and logarithmic functions, higher derivatives, implicit differentiation, and differentials.<br>• Applications of differentiation: related rates, increase, decrease, and concavity, relative extrema, first and second derivative tests, curve sketching, absolute minimum and maximum values of functions, applied maximum and minimum value problems.<br>• Introduction to the concept of integration. Basic integration formulas. The definite integral. | | |
| Teaching Methodology | The course is delivered to the students by means of lectures, conducted with use of the whiteboard.<br>The students are also engaged in the course through questions by the lecturer which are discussed in class.<br>Several examples are solved on the white board, with the participation of students. Students are encouraged to leave their seats and solve examples on the board as well.<br>Students are asked to work on their own during class hours on practice problems, and they are encouraged to ask questions.<br>Many additional exercise sheets and material is available to students through the e-learning platform.<br>Students are encouraged to attend office hours for extra help.<br>Students are encouraged to attend the peer tutoring center for extra help. | | |
| Bibliography | (a) Textbooks:<br>• Anton H., Bivens I and Davis S, *Calculus: Early Transcendentals*, 11th edition, Wiley, 2016.<br>(b) References:<br>• C. Henry Edwards, David E. Penney, *Calculus, Matrix Version*, Pearson Education; 6th edition, 2002.<br>• James Stewart, *Calculus, Concepts and Context*, Thomson | | |

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| | Learning; 3rd Bk & CD edition, 2004. |
| Assessment | (a) Methods: Students will be assessed with coursework that involves two in class written tests and a final exam.<br>(b) Criteria: Assessment criteria are available in each test or in the final exam<br>(c) Weights:<br>Tests 40%<br>Final Exam 60% |
| Language | English |