

# MATH 119

## Calculus with Analytic Geometry

**Frequency:** Fall/Spring Terms

**METU Credit & ECTS Credit:** (4-2)5 & 7.5

**Catalog description:** Functions. Limits and Continuity. Tangent lines and derivatives. Chain rule. Implicit differentiation. Inverse functions. Related rates. Linear approximations. Extreme values. Mean Value Theorem and its applications. Sketching graphs. Indeterminate forms and L'Hospital's rules. Definite integral. Fundamental Theorem of Calculus. Substitution. Areas between curves. Formal definition of natural logarithm function. Techniques of integration. Improper integrals. Arc length. Volumes and surface areas of solids of revolution. Parametric plane curves. Polar coordinates. Arc length in polar coordinates.

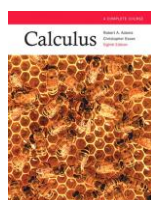
**Justification for the Course Proposal:** This is a fundamental course designed for all science – Engineering Students.

**Course Objectives:** The sequence Math 119-120 is the Standard complete introduction to the concepts and methods of calculus. It is taken by all engineering students. The emphasis is on concepts, solving problems, theory and proofs. All sections are given a uniform midterm and a final exam. Students will develop their reading, writing and questioning skills in Mathematics.

**Course Coordinator:** Yrd.Doc.Dr. Firat Arıkan

MidTerm1: 30 Points (Nov.18 2017 Saturday at 09:30)  
MidTerm2: 30 Points (Dec.23 2017 Saturday at 09:30)  
Final Exam: 40 Points (Jan.11 2018 Thursday at 09:30)  
Quiz/Attendance: 7 Points

**Suggested textbook:**



Robert A. Adams, Christopher Essex  
CALCULUS  
A Complete Course Calculus. Eight Edition.  
ISBN 978 0-321-78107-9  
QA303.2.A33 2013

**Reference Books:** Calculus  
James Stewart, Fifth Edition

**Current Semester Course Home Page:** <http://www.ma119.math.metu.edu.tr/>

Week	Dates	Syllabus(Math 119) 2017-1	
<b>1</b>	<b>Oct 02-06</b> Oct. 02: University Opening Ceremony: 10:00 (8:40, 9:40 and 10:40 classes will not be held)	<b>Ch 0: Preliminaries</b> 0.1 Real Numbers and the Real Line 0.3 Graphs of Quadratic Equations 0.5 Combining Functions to Make New functions 0.7 The Trigonometric Functions	0.2 Cartesian Coordinates in the Plane 0.4 Functions and Their Graphs 0.6 Polynomials and Rational Functions
<b>2</b>	<b>Oct 09-13</b> Add-Drop and Advisor Approvals	<b>Ch 1: Limits and Continuity</b> 1.2 Limits of Functions 1.3 Limits at Infinity and Infinite Limits 1.4 Continuity	<b>1.2</b> : 2,3,4,5,6,11,13,18,22,24,32,56,58, 61,62,63,64 <b>1.3</b> : 3,6,10,14,20,25,29,33,34,50,51 <b>1.4</b> : 1,2,3,4,5,6,9,13,16,18,22,30,32
<b>3</b>	<b>Oct 16-20</b>	1.5 The Formal Definition of Limit <b>Ch 2: Differentiation</b> 2.1 Tangent Lines and Their Slope 2.2 The Derivative 2.3 Differentiation Rules	<b>1.5</b> : 4,6,8,10,12,16,20,27,33,31,37,38 <b>2.1</b> : 3, 5, 9, 13, 15, 17, 19, 21, 23 <b>2.2</b> : 1, 3, 11, 17, 23, 25, 27, 31, 35, 37, 41, 43, 45, 47, 49 <b>2.3</b> : 7, 9, 11, 13, 15, 17, 23, 25, 29, 33, 37, 39, 43, 49, 51, 53
<b>4</b>	<b>Oct 23-27</b>	2.4 The Chain Rule 2.5 Derivatives of Trigonometric Functions 2.6 Higher-Order Derivatives	<b>2.4</b> : 3, 5, 11, 13, 15, 19, 23, 25, 31, 37, 45 <b>2.5</b> : 3, 5, 11, 17, 21, 27, 29, 35, 37, 41, 43, 45, 49, 53, 55, 57, 62 <b>2.6</b> : 1, 7, 11, 13, 21, 25, 26
<b>5</b>	<b>Oct 30- Nov 03</b>	2.8 The Mean-Value Theorem 2.9 Implicit Differentiation <b>Ch 3: Transcendental Functions</b> 3.1 Inverse Functions 3.2 Exponential and Logarithmic Functions 3.3 The Natural Logarithm and Exponential	<b>2.8</b> : 1, 3, 5, 7, 9, 11, 15 <b>2.9</b> : 3, 7, 9, 11, 13, 17, 21, 27 <b>3.1</b> : 3, 9, 12, 17, 19, 23, 26, 29, 34 <b>3.2</b> : 7, 17, 26, 31, 32, 35 <b>3.3</b> : 5, 8, 13, 17, 33, 35, 41, 44, 48, 52, 57, 59, 63, 65
<b>6</b>	<b>Nov 06-10</b> Nov.10: Commemoration of Atatürk (Friday)	3.3 The Natural Logarithm and Exponential 3.5 The Inverse Trigonometric Functions 3.6 Hyperbolic Functions <b>Ch 4: More Applications of Differentiation</b> 4.1 Related Rates	<b>3.5</b> : 7, 9, 11, 15, 24, 31, 35, 39, 47 <b>3.6</b> : 1, 5, 7, 9 <b>4.1</b> : 1, 2, 3, 4, 5, 6, 7, 13, 14, 22, 26
<b>7</b>	<b>Nov 13-17</b>	4.3 Indeterminate Forms <b>Midterm 1 (Nov 18 2017 Saturday at 09:30)</b>	<b>4.3</b> : 1, 3, 5, 7, 9, 13, 15, 17, 19, 24, 26, 28
<b>8</b>	<b>Nov 20-24</b>	4.4 Extreme Values 4.5 Concavity and Inflections 4.6 Sketching the Graph of a Function 4.8 Extreme-Value Problems	<b>4.4</b> : p238: 1, 3, 5, 7, 8, 11, 13, 17, 19, 21, 25, 29, 31, 35, 39 <b>4.5</b> : 1, 3, 5, 7, 9, 11, 13, 14, 16, 17, 19, 25, 27, 29, 31, 35, 39 <b>4.6</b> : 1, 2, 3, 4, 5, 6, 15, 16, 17, 18, 29, 31 <b>4.8</b> : 1, 3, 7, 9, 11, 13, 17, 18, 21, 31, 32, 42
<b>9</b>	<b>Nov 27- Dec 01</b>	4.9 Linear Approximations <b>Ch 5: Integration</b> 5.1 Sums and Sigma Notation 5.2 Areas as Limits of Sums 5.3 The Definite Integral 5.4 Properties of the Definite Integral	<b>4.9</b> : 1, 3, 5, 7, 9, 11, 15, 17, 21 <b>5.1</b> : 3, 5, 11, 13, 17, 21, 31, 33 <b>5.2</b> : 3, 7, 13, 17, 19 <b>5.3</b> : 2, 3, 5, 7, 11, 13, 15, 17 <b>5.4</b> : 1, 2, 7, 9, 11, 13, 15, 17, 19, 21, 25, 29, 31, 35, 36, 37, 39
<b>10</b>	<b>Dec 04-08</b>	5.5 The Fundamental Theorem of Calculus 5.6 The Method of Substitution <b>Ch 6: Techniques of Integration</b> 6.1 Integration by Parts	<b>5.5</b> : 3, 7, 11, 13, 15, 17, 19, 23, 27, 29, 31, 33, 37, 39, 41, 43, 45, 46, 47, 49, 51, 52, 53, 54 <b>5.6</b> : 1, 3, 5, 7, 8, 9, 10, 11, 12, 13, 15, 17, 18, 19, 21, 23, 25, 27, 29, 31, 33, 35, 37, 39, 40, 41, 43, 44, 45, 47, 48, 49, 50, 51 <b>6.1</b> : 5, 7, 10, 11, 13, 15, 17, 19, 21, 23, 25, 27, 28, 29, 33, 37
<b>11</b>	<b>Dec 11-15</b>	6.2 Integrals of Rational Functions 6.3 Inverse Substitutions	<b>6.2</b> : 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 25, 27, 29, 31 <b>6.3</b> : 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 25, 27, 29, 31, 33, 35, 37, 39, 41, 43, 44, 45, 47, 49, 51
<b>12</b>	<b>Dec 18-22</b>	6.5 Improper Integrals <b>Midterm 2 (Dec23 2017 Saturday at 09:30)</b>	<b>6.5</b> : 1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 24, 25, 31, 33, 35, 37, 39, 41, 42
<b>13</b>	<b>Dec 25-29</b> New Year's Day (Monday)	<b>Ch 7: Applications of Integration</b> 5.7 Areas of Plane Regions 7.1 Volumes by Slicing-Solids of Revolution 7.2 More Volumes by Slicing 7.3 Arc Length and Surface Area	<b>5.7</b> : 3, 5, 9, 11, 15, 17, 19, 21, 23, 29 <b>7.1</b> : 1, 3, 7, 11, 13, 15, 19 <b>7.2</b> : 3, 5, 7, 9, 11, 13, 16 <b>7.3</b> : 3, 5, 7, 9, 11, 13, 14, 21, 24, 25, 27, 28, 29
<b>14</b>	<b>Jan 01-05</b>	8.5 Polar Coordinates and Polar Curves 8.6 Slopes, Areas, and Arc Lengths for Polar Curves	<b>8.5</b> : 3, 4, 5, 7, 9, 11, 13, 16, 18, 22, 26 <b>8.6</b> : 2, 4, 7, 11, 12, 20
<b>Final Exam (Jan 11 2018 Thursday at 09:30)</b>			