Subject:	Mathematical Analysis I	**Code**	93.26
Credits:	6		
Department	**Exact and Natural Sciences**	**Version**	2018

Course: Computer Science Engineering

Curriculum: S10 A - Rev18, S10-Rev23, S10 - Rev18

Objectives:

No.	Description
1	The general objective of the subject is to provide the student with basic knowledge of differential and integral calculus in a variable, which can be applied in computer science engineering. At the end of the course, the student is expected to: 1. Model simple situations in the language of differential and integral calculus. 2. Read and write correctly in mathematical language. 3. Solve discipline-specific problems by appropriately combining theoretical reasoning with calculation methods. 4. Pose problems and solve them using the most appropriate differential and integral calculus tools. 5. Recognize and judge the main characteristics of the basic bibliography.

Contents:

Limit and Continuity. Derivative. Theorems on Differentiable Functions. Functions Analysis. Relative and Absolute Extremes. Taylor polynomials. Primitives. Definite Integral. Applications of Integral Calculus

Required bibliography:

No.	Description
1	Thomas, G., Calculus: one variable, 12ed., Addison-Wesley, 2010.

Optional bibliography:

No.	Description
1	Apostol, T. , Calculus, Volume 1, 2nd edition, Reverté, 1990.
2	Stewart, J., Calculus, 6th ed., Cengage Learning, 2008.
3	Spivak, M., Infinitesimal Calculus, 2nd edition, Reverté, 1998.
4	Noriega, R., Differential and Integral Calculus, Docencia, 1979.

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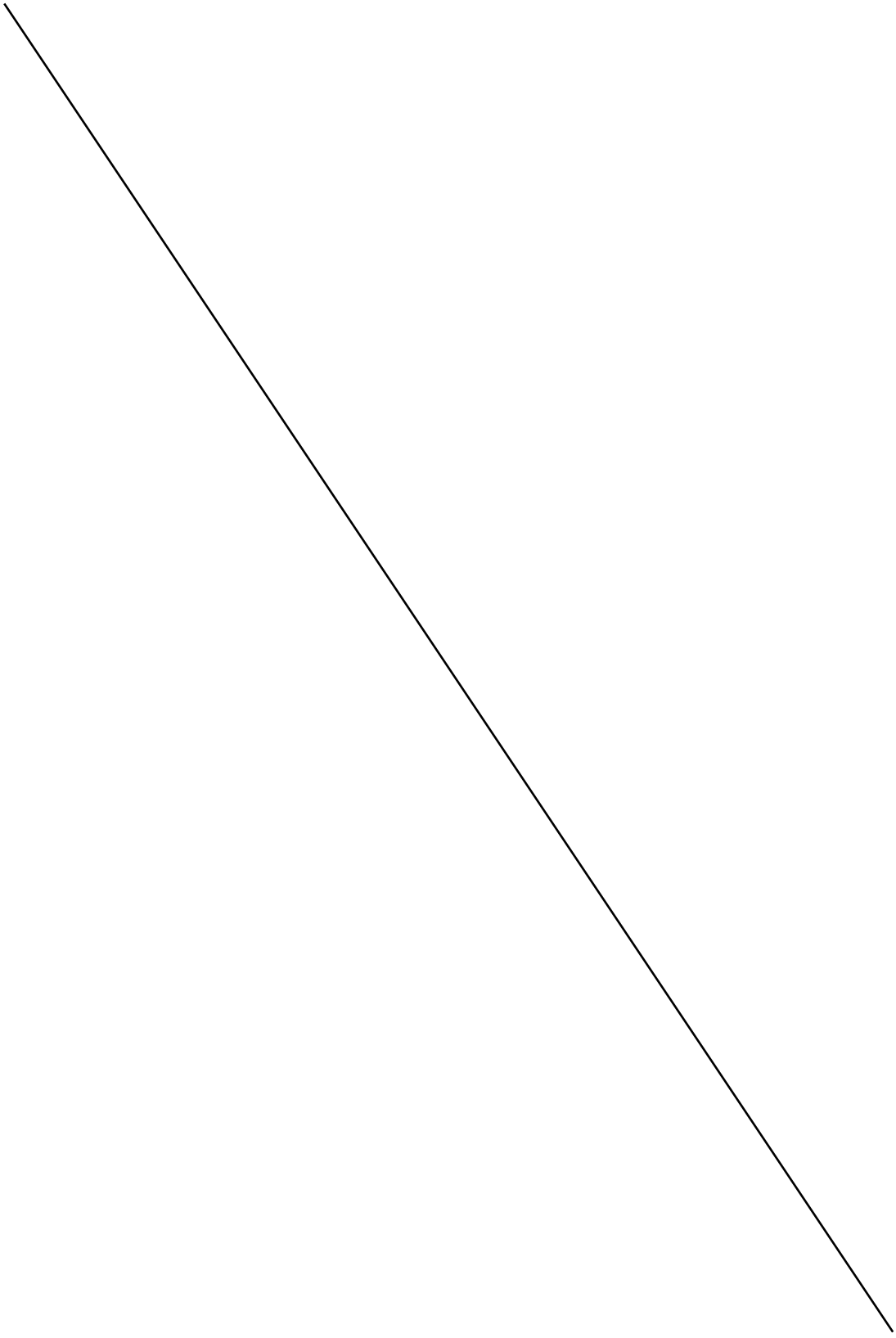
Course transcript:

No.	Description
1	**Limit and Continuity.** Limit of a variable. Limit of a function. Function tending to infinity. Bounded functions. Theorems on limits. Notable limits. Continuity of a function. Properties. Theorems on continuity: Bolzano and intermediate value.
2	**Differential Calculus** Geometric motivation. Definition of the derivative. Interpretations of the derivative. Derivative of elementary functions. Derivative rules. Derivative of a composite function. Implicit derivative. Inverse function and its derivative. Derivatives of different orders. Differential of a function, application to the approximate calculation of functions. Equation of the tangent and normal line to a curve.
3	**Theorems on Differentiable Functions.** Rolle's theorem. Lagrange's theorem. Cauchy's theorem. L'Hospital's rule.
4	**Applications of differential calculus** Analysis of functions: growth, concavity, relative extrema, inflection points, asymptotes, qualitative graph of a function. Optimization: absolute extrema.
5	**Approximation by polynomials** Taylor and Mc Laurin polynomials. Basic properties. Mc Laurin polynomials of some notable functions: sine, cosine, exponential, etc. Taylor's formula. Lagrange error formula. Application to the approximate calculation of functions.
6	**Definite Integral.** Primitive function. Properties. Change of variable. Integration by parts. Rational functions. Decomposition into simple fractions. Trigonometric substitutions. Integrals of trigonometric functions.
7	**Definite Integral.** Motivation: calculation of areas. Definition of the Riemann integral. Properties. Fundamental theorem of calculus. Barrow's rule.
8	**Applications of Integral Calculus** Calculation of areas. Work of a force. Arc length of a curve. Calculation of the volume of bodies of revolution.
9	**Successions and series** Numerical sequences. Limits. Infinite series. Telescoping series. Geometric Series. Convergence Criteria: Comparison Criterion for Series of Positive Terms. Root Criterion and Quotient Criterion. Alternating Series. Conditional and Absolute Convergence. Improper integrals.

Practical assignments:

No.	Description



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No.	Description
1	**Exercise Guides** 1. Limits. 2. Continuity. 3. Derivative. 4. Mean value theorem. 5. Applications of derivatives. 6. Taylor polynomials. 7. Primitives. 8. Definite Integral. 9. Applications definite integrals.

Laboratory assignments:

No.	Description
1	**Not applicable to this subject. null**

Professor in charge:	Mancilla Aguilar, Jose Luis
Head of Department:	Stripeikis, Jorge Daniel