Program	59EC – Communications Electronic Engineering B. Eng.
	59SC – Telecommunications Systems Engineering B. Eng.
	59SO – Sound and Image Engineering B.Eng.
	59TL – Telematics Engineering B. Eng.

Course number and name	
Number	595000003, 595000302, 595000102, 595000202
Name	Calculus I
Semester	S1 [(September-January)]

Credits and contact hours	
ECTS Credits	6
Contact hours	60

Coordinator's name	López-Salazar Codes, Jerónimo
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Specific course information
Description of course content
The aim is to consolidate and give rigour to the knowledge of infinitesimal calculus that the student had acquired in the secondary education: limits, continuity, derivability and integrability. New concepts are also introduced such as differential equations, sequences and series of real numbers and series of functions.
List of topics to be covered
1. Real functions of real variable.
1.1. Introduction to the real numbers.
1.2. Limits and continuity.
1.3. Derivatives.
1.4. Rolle's theorem. Theorem of the medium value.
1.5. L'Hôpital's rule.
1.6. Monotonicity, concavity and local extrema.
1.7. Taylor's theorem.
2. The Riemann Integral.
2.1. Definition and properties.
2.2. Fundamental Theorem of Calculus.
2.4. Improper integrals.
3. First order ordinary differential equations.
3.1. Definition of differential equation.
3.2. Separation of variables.
3.3. Homogeneous equation.
3.4. Linear equation.

3.5. Bernoulli's equation.
4. Numerical series and sequences.
4.1. Limit to the sequences.
4.2. Monotone sequences.
4.3. Numerical series.
4.4. Telescoping and geometric series.
4.5. Series of positive terms. Convergence criterion.
4.6. Alternating series. Leibniz rule.
4.7. Absolutely convergent series.
5. Power series.
5.1. Convergence interval.
5.2. Integration and derivative.
5.3. Taylor series.
6. Fourier series.
6.1. 2π-periodic function.
6.2. Pairing and unpairing functions.
6.3. Arbitrary function.
6.4. Dirichlet's.
Prerequisites or co-requisites
None

Specific goals for the course

Specific outcomes of instruction

- RA1082 – To know the concepts of continuity and derivative of a real variable and of the main related theorems.
- RA1085 – To solve the basic examples of the ordinary differential equations.
- RA1100 – To know the fundamental theorem of the Calculus.
- RA1088 – To develop elementary functions in power series.
- RA1089 – To develop periodic functions in Fourier series.
- RA1087 – To analyze the convergence of numerical series.

Further reading and supplementary materials

- J. Burgos. Cálculo infinitesimal de una variable. McGraw-Hill. 2007.
- A. García, F. García, A. Gutiérrez, A. López, G. Rodríguez, A. Villa. Cálculo I. Teoría y problemas de Análisis Matemático en una variable. CLAGSA, 2007.
- R. Larson, B.H. Edwards. Cálculo I. McGraw Hill, 2010.
- S.L. Salas, E. Hille, G.J. Etgen. Calculus, vol. 1. Reverté, 2006.
- M. Spivak. Calculus. Reverté, 2012.