

General Analysis

1. **Course number and name:** 020ANGCI1 General Analysis
2. **Credits and contact hours:** 6 ECTS credits, 3x1:15 contact hours
3. **Name(s) of instructor(s) or course coordinator(s):** Nancy Chalhoub
4. **Instructional materials:** Course handouts; slides; in-class problems

5. **Specific course information**

a. **Catalog description:**

Set of real numbers, real functions, trigonometric functions, logarithmic functions, power functions, inverse trigonometric functions, hyperbolic functions, linear first order differential equations, second order differential equations with constant coefficients, real and complex sequences, limits and continuity of real functions, differentiability, Roll's Theorem, applications.

b. **Prerequisites:** None

c. **Required/Selected Elective/Open Elective:** Required

6. **Educational objectives for the course**

a. **Specific outcomes of instruction:**

- Identify common functions and apply their properties properly
- Solve first and second order linear differential equations
- Recognize the main properties of the set of real number and identify the extrema of subsets
- Calculate limits of sequences and use the definition of limits to prove convergence
- Manipulate functions of one real variable, identify their extrema and prove their continuity
- Identify differentiable functions of one real variable and convex functions, and apply the Rolle's Theorem

b. **PI addressed by the course:**

PI	1.3
Covered	x
Assessed	x

7. **Brief list of topics to be covered**

- Learning and writing mathematics: Learning mathematics, Mathematical language, Writing mathematics, Basic principles, Problematic writing cases (1 lecture)

- Generalities on calculation principles: Sets of numbers, Set of real numbers (3 lectures)
- Generalities on real functions: Definitions, operations, and transformations, Functions and order relation, Parity/periodicity/symmetry, Continuity/derivability/bijections, Study of a function (3 lectures)
- Common functions: Logarithmic and exponential functions, Power functions, Circular functions - Inversion, Hyperbolic functions - Inversion (6 lectures)
- Linear differential equations: Calculation of primitives, Generalities on differential equations, First-order linear differential equation, Second-order linear differential equation with constant coefficients (4 lectures)
- Extensions on real numbers: Properties of $\mathbb{R}$, Intervals and density (5 lectures)
- Numerical sequences: Generalities, Limits of a real sequence, Extracted sequences, Adjacent sequences, Specific sequences, Upper/lower bounds, density and limits, Extension to complex sequences (5 lectures)
- Limits and continuity of numerical functions: Limits of real functions, Continuity of real functions, Extension to complex functions (4 lectures)
- Differentiability of numerical functions: Differentiable functions, Higher-order derivatives, Applications of the derivative, Convex functions (4 lectures)