Universidad de los Andes
Facultad de Ciencias

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DEPARTAMENTO DE MATEMÁTICAS

OFRECIMIENTOS DE CURSOS

2019-1

Nivel del Curso 4: posgrado X__ 3: final de carrera X__ 2: mitad de carrera ___ 1: inicio de carrera ___#	**Nombre completo del curso en español**: Basics of Convex and Discrete Geometry#
	Nombre completo del curso en inglés: Basics of Convex and Discrete Geometry#
	Nombre abreviado en español (Máx. 30 caracteres contando espacios) Este será el que aparezca en Banner. Basics of Convex and Discrete Geometry#
	Profesor: Susanna Dann#
Descripción del curso en español:#	
Descripción del curso en inglés: This course will serve as an introduction to convexity. We start with the basics of convex sets, with theorems of Helly, Radon and Caratheodory and their applications. We continue with convex polytopes and prove three jewels of convexity: theorems of Steiniz, Cauchy and Minkowski. Lastly, we start to develop the beautiful Brunn-Minkowsky theory that combines ideas of algebra, geometry and analysis.	
Prerrequisitos: MATE 1105 Linear Algebra, MATE 1207 Calculo Vectorial, MATE 1102 Matematica Estructural, #	

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Objetivos:

This course will provide students with basic notions of convexity. We will discuss some classical and beautiful results in convexity and their connections and applications to different areas of mathematics. We will point out open problems related to the material we cover. Along the way, students will sharpen und deepen their knowledge of linear algebra and calculus.

Contenido:

Part One: Separation theorem, Caratheodory`s theorem, Radon`s theorem, Helly`s theorem, Blaschke selection principle and their applications (e.g. Given a finite set of points in Euclidean n-dimensional space with cardinality greater or equal to n+1. What is the minimal radius of the ball containing this set?)

Part Two: Polytopes: vertices, faces and facets; Euler`s theorem; Main theorem for polytopes: equivalence of definitions as a convex hull of finitely many points or intersection of finitely many half-spaces; duality. Theorems of Steiniz, Cauchy and Minkowski.

Part Three: Brunn-Minkowski theory: Minkowski`s theorem (volume of a linear combination of convex bodies is a homogeneous polynom in the coefficients), Brunn-Minkowski inequality, Brunn`s theorem.

If time allows: Steiner symmetrization and isoperimetric inequality.

Forma de Evaluación: There will be homework assignments every week.#

Bibliografía:

1. A. Barvinok, “A Course in Convexity”.
2. T. Bonnesen and W. Fenchel “Theory of Convex Bodies”.
3. Ludwig Danzer, Branko Gruenbaum, and Victor Klee “Helly`s theorem and its relatives”.
4. R. Gardner “The Brunn-Minkowski Inequality”.
5. Branko Gruenbaum “Convex Polytopes”.
6. J. Matousek “Lectures on Discrete Geometry”.
7. Roger Webster, “Convexity”.
8. Guenter Ziegler “Lectures on Polytopes”.

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