

Actividades Formativas IMEIO/ Educational Activities IMEIO

Título/Title: Geometric analysis
Organizador/Organizer: Daniel Fox, daniel.fox@upm.es
Profesores/Lecturers: Daniel Fox
Horas totales/Number of hours: 10
Lugar/Location: ETSIDI en principio, pero se podría impartir en Ciudad Universitaria también.
Fechas/Dates: 14(V), 18(L), 21(V), 25(L), 28(V) de enero 2022 (hay cierta flexibilidad)

The course will be given in Spanish or English, according to the preferences of the participants.

The course will introduce basic techniques in geometric analysis and give some applications. Specifically, there will be studied the growth of functions and tensors on Riemannian manifolds solving equations and inequalities expressed in terms of their Laplacians. The analytic techniques used will be elementary, such as the maximum principle for elliptic equations, and the necessary tensor calculus will be recalled.

The following list indicates the specific topics that it is intended to study.

1. Review of ingredients from Riemannian differential geometry
 - (a) Completeness. Hopf-Rinow Theorem.
 - (b) Hessian and Laplacian comparison theorems for the distance function.
 - (c) Cut locus and differentiability of the distance function.
 - (d) Bochner vanishing theorem.
2. Cheng-Yau gradient estimate and growth of harmonic functions
 - (a) Growth of harmonic functions on Euclidean space
 - (b) Gradient estimate for eigenfunctions of the Laplacian
 - (c) Harnack inequality
 - (d) L_p harmonic functions
3. Applications to the geometry of submanifolds
 - (a) Refined Kato inequalities.
 - (b) Growth of positive functions satisfying differential inequalities.
 - (c) Applications in geometry of submanifolds.
 - i. Simons's formula for the Laplacian of the second fundamental form of a minimal or CMC hypersurface and its applications.
 - (ii) Calabi's formula for the Laplacian of the Pick form of an affine hypersphere and its applications.

¿Aceptarías que el curso se pudiera emitir por videoconferencia restringido a algunos alumnos del doctorado que no pudieran asistir presencialmente? Sí