

Center for Mathematical Sciences Lectures

Mallat Family Fund for Research in Mathematics

invites you to a

DISTINGUISHED LECTURE SERIES

to be presented by

1994 Fields Medalist



Professor Pierre-Louis Lions

Collège de France, Université Paris 9 "Dauphine"
and École Polytechnique

**All lectures will take place at Auditorium 232
Amado Mathematics Building**

**Lecture I: Tuesday, April 12, 2011 at 15:30
Special Colloquium**

Introduction on Mean Field Games

This talk will be a general presentation of Mean Field Games (MFG in short), a new class of mathematical models and problems introduced and studied in collaboration with Jean-Michel Lasry. Roughly speaking, MFG are mathematical models that aim to describe the behavior of a very large number of "agents" who optimize their decisions while taking into account and interacting with the other agents. The derivation of MFG, which can be justified rigorously from Nash equilibria for N players games, letting N go to infinity, leads to new nonlinear systems involving ordinary differential equations or partial differential equations. Many classical systems are particular cases of MFG like, for example, compressible Euler equations, Hartree equations, porous media equations, semilinear elliptic equations, Hamilton-Jacobi-Bellman equations, Vlasov-Boltzmann models... In this talk we shall explain in a very simple example how MFG models are derived and present some overview of the theory, its connections with many other fields and its applications.

Lecture II: Thursday, April 14, 2011 at 14:30

Mean Field Games: Mathematical Theory and Applications I

In this talk, we present one class of Mean Field Game models and its mathematical structure. We explain the two types of situations where these problems are well-posed. And we discuss some basic mathematical properties such as uniqueness, existence and regularity of solutions.

Lecture III: Thursday, April 14, 2011 at 16:00

Mean Field Games: Mathematical Theory and Applications II

In this talk, we explain why an infinite dimensional setting is needed for Mean Field Game models and we discuss its mathematical structure. The general theory will be illustrated in the simpler situation of a discrete state space (for the players).