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In this talk, I will address the problem of the modeling and the construction of a class of diffusion processes whose time marginal distributions are constrained to lie at any time in a particular subset of the space of probability measures. This type of diffusion processes appeared in various applied situations (such as Finance, stochastic mechanics, fluid dynamics, ...) and their modeling leads to the introduction of a singular class of stochastic differential equations. After a short presentation of the main difficulties raised by these equations, I will present some results concerning the construction of solutions, though suitable penalized approximations, which are obtained by combining stochastic calculus and variational calculus on probability space. This research is funded by the project Fondecyt Iniciación 11130705. (Received January 20, 2015)