Course Title: Hydraulics	**Number of Units:**1
SSD :ICAR/01	**CFU:** 6
Course aims: The course will develop a comprehensive view of unsteady free surface flows of water, considered as an incompressible fluid, at a large scale (rivers, lakes) by recovering the fundamental equations in 1, 2 and 3 spatial dimensions. Numerical solutions by finite volume and finite difference methods will be developed for 1D and 2D models. Furthermore an introduction to transport problems of either a passive scalar quantity or an active one will be given.	
Course Description Introduction to the equations of unsteady water flow at different dimensionality, conservative and non conservative (classical) formulations. Discussion of dimensionality and resolution problems (DSV, SWE, RANS, DANS, LES, DNS). Hyperbolic property for 1D and 2D shallow water equations and its consequences. Focus on 1D and 2D problems to deal with large scale environmental flows. Characteristic method for the De Saint-Venant equations. Finite volume and finite difference discretization of model equations. Implicit and explicit schemes. Role and treatment of source terms, well balanced schemes and C-property. Riemann problems and approximate riemann solvers for the numerical flux evaluation. Introduction to scalar transport.	
Assumed Background: Numerical methods	
Assessment methods: Discussion on the computer implementation of a case study and oral examination	