

# Willmore-Like Energies and Elastic Curves with Potential

**Alvaro Pampano**

Department of Mathematics, University of the Basque Country, Spain

E-mail: [alvaro.pampano@ehu.es](mailto:alvaro.pampano@ehu.es)

## ABSTRACT

In the last decades, there has been an intensive investigation of Willmore surfaces due to the strong connections they have in Physics and in other areas. In particular, some of these applications are based on a beautiful link between Willmore surfaces and elastic curves. Here, we have a twofold purpose. Firstly, for any surface of a 3-dimensional Riemannian manifold we will generalize the Willmore energy by introducing a potential, Willmore-like energies. Then, the first variation formula and the associated Euler-Lagrange equation will be derived. Secondly, focusing our analysis on surfaces in total spaces of Killing submersions we will establish a connection between invariant Willmore-like tori and elastic curves with related potentials in the base surfaces. Finally, previous results will be applied to construct foliations of certain Killing submersions by Willmore tori with constant mean curvature.