# INTRODUCTION TO THE FINITE ELEMENT METHOD. NUMERICAL SIMULATION WITH FREEFEM++

*Lecturer:* Giuseppe Viglialoro
*Period:* June/July 2015. *Schedule:* to be established
*Final evaluation:* written tests and/or exercises
*Registration:* By emailing Prof. Giuseppe Viglialoro (giuseppe.viglialoro@unica.it)
*Prerequisites*: Calculus and Analytic Geometry; Numerical Analysis; Numerical Methods for ODE (Ordinary Differential Equations). It is also strongly recommended to attend the previous corse (May, 2015) "Metodi Analitici e Numerici per la risoluzione di equazioni alle derivate parziali", by Prof. Sebastiano Seatzu.

## COURSE OVERVIEW

1. Basic concepts and classification of PDE (Partial Differential Equations):
    a. Laplace's equation, wave equation, heat equation.
2. The Finite Difference Method:
    a. Steady and time dependent equations.
3. The finite element assistant Freefem++. Installation, configuration and first steps. Paraview Software.
4. Numerical resolution with Freefem and Paraview.
    a. Equilibrium equations of a prestressed.
    b. Blow-up solutions for a general Keller-Segel model.

*Remark:* Due to its practical nature, all the participants are strongly suggested to use a laptop, with these two on-line available programs installed: FreeFem++ and Paraview.