



MAFIA - the seminar you can't refuse

Umbral Calculus, Methods and Applications

Silvia Licciardi

Enea Research Center Frascati

October 15, 2019

13:15–14:15

in T112

Fakulta jaderná a fyzikálně inženýrská ČVUT
Trojanova 13, 12000 Praha

Abstract: The talk is aimed to give an introduction of Umbral Calculus Theory. It will provide an account of the theory and applications of Operational Methods allowing the "translation" of the theory of special functions and polynomials into a "different" mathematical language. The language I refer to is that of symbolic methods, largely based on a formalism of umbral type which provides a tremendous simplification of the derivation of the associated properties, with significant advantages from the computational point of view, either analytical or in deriving efficient numerical methods to handle integrals, ordinary and partial differential equations, special functions and solutions of physical problems. The strategy I will follow is that of establishing some rules to replace higher transcendent functions in terms of elementary functions, taking advantage from such a recasting. The formulated technique is general enough to be readily extended to the fractional calculus including fractional ordering problems, namely the use of non-commuting operators in fractional evolution equations and to time ordering. We underscore the versatility and the usefulness of the proposed procedure by presenting various applications of the method in different fields of Mathematics and Physics.