ΠΑΝΕΠΙΣΤΗΜΙΟ ΚΡΗΤΗΣ
ΤΜΗΜΑ ΦΥΣΙΚΗΣ

ΓΕΝΙΚΟ ΣΕΜΙΝΑΡΙΟ ΤΜΗΜΑΤΟΣ ΦΥΣΙΚΗΣ

PHYSICS COLLOQUIUM

Thursday, 17 March 2011

17:00 -18:00

3rd Floor Seminar Room

"On the Modelling of Complex Systems-Methodologies and Applications"

Nikos Christakis

Physics Department, University of Crete

Abstract

Complex systems appear in abundance throughout science and engineering. Such systems are difficult to resolve, since they involve many interacting components with different physical properties over different spatial and temporal scales and exhibit high levels of uncertainty. For the modelling and representation of complex systems, a number of techniques and methodologies have been developed over the past decades. In this talk, we review some of the most important ones, which are based either on data analysis or on the physical understanding of the processes involved and their interactions. Examples from their application are given and we also discuss their advantages and disadvantages. Then, we introduce a hybrid approach for the modelling of complex systems and a complete description of the developed mathematical-computational hybrid framework is given. Applications from the field of particulate-based engineering are presented and the ability of the hybrid framework is demonstrated to accurately represent complex processes with the aid of information extracted from different spatio-temporal scales.