CEA-Direction des Sciences de la Matière

# Institut de Physique Théorique

*Unité de recherche associée au CNRS*

## Cours de Physique Théorique de l'IPhT, année 2009-2010

*Organisés en collaboration avec*

**Ecole Doctorale de Physique de la Région Parisienne - ED 107**

## *Dynamical processes on complex networks*

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*Les vendredis 8/1, 15/1, 22/1, 5/2/2010.*

In this set of lectures, I will provide a general introduction to complex networks and to some research themes in dynamical processes on such structures. These lectures are aimed to a non-specialist audience with a minimal knowledge of probability theory. The tentative plan is:

1) Introduction: Complex networks, dynamical processes
- Examples of real-world networks
- Examples of processes: from synchronization to the voter model

2) Models of complex networks
- The archetype: Erdos-Renyi random graph
- A small-world: Watts-Strogatz
- Broad degree and weight distributions: Barabasi-Albert and variants

3) Percolation and failure cascades on complex networks
- Motivation
- General results
- Importance of the degree distribution: percolation threshold for scale-free networks

4) Epidemic spread on complex networks
- Spread of diseases over contact networks; rumor spread
- Spread of diseases in metapopulation models: mean-field approach; fluctuations and existence of a pandemic threshold

***Horaires*** *: les vendredis de 10h00 à 12h15.*
***Lieu*** *: IPhT, CEA Saclay, Orme des Merisiers, Bât. 774, p.1A Salle C. Itzykson.*
***Accès*** *: Par lignes de bus publics (269.02 et 91.06) ou*
*- navettes CEA: RER B Le Guichet vers CEA Orme Bât. 774, toutes les 15 min de 8h00 à 9h45;*
*- navette CEA: CEA Orme Bât. 774 vers RER B Le Guichet à 12h36.*
***Renseignements*** *:* `http://ipht.cea.fr` *ou* `ipht-lectures@cea.fr`

*(Mise à jour affiche: 2009-12-04)*