The goal of this class is to acquire mathematical tools and engineering insight about networks whose structure is random, as well as decentralized processes that take place on these networks.

Content
- Course Introduction: Tree Percolation, Branching Processes
- Random Graphs 1: Models, Threshold Functions, Appearance of Subgraphs
- Random Graphs 2: Giant Component and Connectivity
- Random Graphs 3: Other models: the Random Regular Graph, Small World Networks, Scale-Free Networks.
- Evolution, Dynamics and Inference 1: Epidemics, Network and Source Discovery.
- Evolution, Dynamics and Inference 2: Information Cascades.
- Applications 1: Network Formation Games.
- Applications 2: Homophily, Structural Balance.

Keywords
Random graphs, percolation theory, social networks, communication networks.

Learning Prerequisites
Required courses
Stochastic models in communication (COM-300), or equivalent.

Important concepts to start the course
Basic probability and statistics; Markov chains; basic combinatorics.

Learning Outcomes
By the end of the course, the student must be able to:
• Analyze social and communication systems
• Model such systems as stochastic models
• Compute key properties of these models

Teaching methods
Ex cathedra lectures, exercises, mini-project

Expected student activities
Attending lectures, bi-weekly homeworks, mini-project incl. student presentation at the end of semester, final exam.

Assessment methods
1. Homeworks 10%
2. Mini-project 40%
3. Final exam 50%

Supervision
Office hours Yes
Assistant Yes
Forum No

Resources
Bibliography

Ressources en bibliothèque
• Random Graphs / Bollobas
• Random Graphs / Janson
• Continuum Percolation / Meester
• Percolation / Grimmett
• Networks, Crowds and Markets / Easley
• Poisson Approximation / Barbour
• Random Graph Dynamics / Durrett

Notes/Handbook
Class notes will be available on the course website.

Websites
• http://icawww1.epfl.ch/class-nooc/