

# USEET2 - Complex Networks: Data Analysis and Network Science

## Présentation

### Prérequis

- Algorithms and programming
- Good programming skills
- Python programming language

### Objectifs pédagogiques

The course aims to introduce the interdisciplinary academic field of network science and the modern theory and applications of complex networks. By the end of the course, students will be able to analyse and model data using network science, use centrality measures, network metrics and tools to analyse and understand complex networks from different domains.

## Programme

### Contenu

The course presents the concepts and methods used in complex network analysis, network models (random, small-world, scale-free) and processes on networks, theory and modelling of complex networks, analysis of real-world network datasets.

Topics:

- Introduction to Network Science and Complex Network Analysis
- Network properties and basic definitions
- Network metrics and centrality measures
- Random networks and small world networks
- Scale-free networks
- Community detection in networks

*complementary content:*

- Spreading phenomena
- Applications of network science and analysis of real-world networks
  - Epidemic models over networks
  - Social networks
  - Biological networks
  - Technological networks

### Modalités de validation

- Contrôle continu
- Projet(s)
- Examen final

### Description des modalités de validation

The evaluation consists of Research report and presentation (roughly corresponding to 1 ECTS) and/or Project implementation and presentation (roughly corresponding to 2 ECTS) and/or written exam; remote students would not undergo all the evaluation steps, but will have the written exam.

The research report has to cover a topic from network science and demonstrate known concepts, models and theories from network science. The research report has to be presented to the teacher.

The project consists of implementing a network science analysis task which typically involves the collection of data, modelling the data using networks, using network metrics to analyse the data, applying different network tools and algorithms to uncover the network properties and behaviour.

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**Code : USEET2**

Unité spécifique de type cours

6 crédits

**Responsabilité nationale :**

EPN05 - Informatique / 1

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