

# PHYS7332 Spring 2018 Network Science Data II: Syllabus

## Course Description and Objectives:

The class is an interdisciplinary course focusing on practical exercises in real network data. In this class, students will learn how to retrieve network data from the real world, analyze network structures and properties, study dynamical processes on top of the networks, and visualize networks. The main programming used in this course is Python 3.5.x.

## Prerequisites:

PHYS5116 or equivalent; PHYS7331 or equivalent; otherwise please contact the instructors before enrolling to the class. Python programming experience is required. Instructors will provide extra tutorials if necessary.

## Topics Overview:

- I. Statistical, structural and content analysis of network data
- II. Centrality Measures
- III. Network Sampling and Network Filtering
- IV. Dynamics on Networks
- V. Temporal Networks
- VI. Community Detection
- VII. Network Visualization
- VIII. Advanced topics (e.g. multiplex networks, big data network analysis, ..)

## Instructors:

Dr. Matteo Chinazzi, [m.chinazzi@northeastern.edu](mailto:m.chinazzi@northeastern.edu)

Office hours: Wednesday 2pm-3pm or by appointment.

Location (off campus): 10th floor, 177 Huntington Avenue, Boston, MA 02115, USA

Dr. Qian Zhang, [qi.zhang@northeastern.edu](mailto:qi.zhang@northeastern.edu)

Office hours: by appointment.

Location (off campus): 10th floor, 177 Huntington Avenue, Boston, MA 02115, USA

## Logistics:

**Date range:** Jan 8, 2018 to April 27, 2018

**Time:** 5pm-7:10pm

**Days:** Tuesday and Thursday

**Venue:** TBD

## Class Materials, Announcements, and Communications:

All the materials, announcements, assignments will be posted on Piazza (<https://piazza.com/northeastern/spring2018/phys7332/>).

## **(Optional) Textbooks:**

There is no required textbook for this class. Instructors will provide the required reading materials but the following textbooks are recommended:

1. *Network Science*, Barabasi, <http://barabasilab.com/networksciencebook/>
2. *Networks: an Introduction*, Newman, Oxford University Press
3. *Dynamical Processes on Complex Networks*, Barrat, Barthelemy and Vespignani, Cambridge University Press
4. *Python Data Science Handbook*, Jake VanderPlas, <https://github.com/jakevdp/PythonDataScienceHandbook>

## **Coursework:**

- I. 10/12 weekly problem sets: 50%
- II. In-class quizzes: 20%
- III. Final exam(s): In-class 15% + Take-home 15%

## **Problem sets:**

- Students are going to implement - from scratch - some of the concepts outlined in class using Python programming language (version 3.5.x).
- Instructions on how to submit the assignments is going to be provided in class.
- Each problem set will be posted on Thursday after the class, and due on the next Tuesday 11:59PM EST. Late submissions will be penalized by deducting 20% for every 8 hours.

## **In-class quizzes:**

Students are going to take in-class quizzes covering the materials of the previous classes and they might be required to provide not only theoretical answers but also pseudo-code implementations of the algorithms explained in class.

## **Final exams:**

The final exam will consists of two parts:

- In-class written examination;
- Take-home programming examination.

## **Academic Integrity:**

The university views academic dishonesty as one of the most serious offenses that a student can commit while in graduate school and imposes appropriate sanctions on violations. Cheating on homework will not be tolerated.

Please visit <http://www.northeastern.edu/osccr/academic-integrity-policy/> for more information.