

Content

Course Code	Course Name	Semester	Theory	Practice	Lab	Credit	ECTS
INF 514	Complex Networks Analysis	2	3	0	0	3	6

Prerequisites	
Admission Requirements	

Language of Instruction	English
Course Type	Elective
Course Level	Masters Degree
Objective	In this class, we will describe both theoretical and practical aspects of complex networks analysis. We will review some basic graph theoretical concepts allowing to define the main properties observed in real-world complex networks (small-world effect, scale-free networks, preferential attachment, etc.). We will also describe the principal models allowing to randomly generate networks. We will present the main methods and tools used to analyze and interpret networks (community detection, link prediction, information propagation, resilience to attacks...). As an illustration, we will apply them to some real-world data (Internet, social networks, etc.)
Content	1. Introduction 2. Basic graph theoretical notions 3. Random graphs and models I 4. Random graphs and models II 5. Network properties I 6. Network properties II 7. Community detection I 8. Community detection II 9. Community detection III 10. Epidemics and information propagation I 11. Epidemics and information propagation II 12. Dynamic networks I 13. Dynamic networks II 14. Link prediction
References	• M. E. J. Newman, The structure and function of complex networks, SIAM Review 45:167-256,2003. • R. Albert and A.-L. Barabasi Statistical mechanics of complex networks. Rev. Mod. Phys., 74(1), 2002. • S. N. Dorogovtsev, Lectures on Complex Networks, Oxford University Press, 2010.

Theory Topics

Week	Weekly Contents
1	Introduction
2	Basic graph theoretical notions
3	Random graphs and models I
4	Random graphs and models II
5	Network properties I
6	Network properties II
7	Community detection I
8	Community detection II
9	Community detection III
10	Epidemics and information propagation I
11	Epidemics and information propagation II
12	Dynamic networks I
13	Dynamic networks II
14	Link prediction