



IDENTIFYING DATA

Economical and Social Networks

Subject	Economical and Social Networks			
Code	V05M145V01323			
Study programme	Telecommunication Engineering			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	5	Optional	2nd	1st
Teaching language	Spanish			
Department				
Coordinator	Sousa Vieira, Estrella			
Lecturers	Sousa Vieira, Estrella			
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General description	Social and Economic networks tackles the dynamic and structural study of networks of relationship between agents that arise in the fields of telecommunications, economy and sociology. We study, in particular, dynamic models of diffusion of information, of contagion, of strategic balance and of training of coalitions. The theoretical contents are applied to a practical study case.			

Competencies

Code	
A1	CB1 Knowledge and understanding needed to provide a basis or opportunity for being original in developing and/or applying ideas, often within a research context.
A3	CB3 Students must integrate knowledge and handle complexity of formulating judgments based on information that was incomplete or limited, including reflections on social and ethical responsibilities linked to the application of their knowledge and judgments.
B4	CG4 Capacity for mathematical modeling, calculation and simulation in technological centers and engineering companies, particularly in research, development and innovation tasks in all areas related to Telecommunication Engineering and associated multidisciplinary fields.
B8	CG8 Ability to apply acquired knowledge and to solve problems in new or unfamiliar environments within broader and multidiscipline contexts, being able to integrate knowledge.
C26	CE26/TE3 Ability to understand and know to exploit the processes of training and dissemination of information in social networks, applying them to the improvement of Internet
C27	CE27/TE4 Ability to design and manage distributed systems based on learning and incentive

Learning outcomes

Expected results from this subject	Training and Learning Results
Understand the static and dynamic phenomena that explain the structure of the social networks	B4 C26
Know how to analyse the mechanisms of training of networks in strategic terms	B4 B8 C26 C27
Know how to model and apply to real data the processes of diffusion of information in social networks	A1 A3 C26 C27
Know how apply the procedures of structural and dynamic analysis of the networks to analyse complex systems in the technological fields, biological, economic and social.	A1 A3 B4 B8 C26 C27

Contents

Topic	
1. Basic models	a. Empirical evidence b. Descriptive parameters, centrality and importance c. Scaling laws
2. Training of networks	a. Random models: static training b. Random models: dynamic training c. Strategic training: stability, efficiency and incentives
3. Diffusion and learning in social networks	a. Simple diffusion SIR, SIS and others b. Learning and reinforcement in networks c. Games in networks: strategic complements and strategic substitutes
4. Applications	a. Meritocracy. Identification of experts and leaders b. Trending topics c. Recommendations/punctuations d. Virality e. Origins of rumours

Planning

	Class hours	Hours outside the classroom	Total hours
Project based learning	6	36	42
Autonomous problem solving	4.5	21	25.5
Lecturing	18.5	36	54.5
Essay questions exam	2	0	2
Objective questions exam	1	0	1

*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.

Methodologies

	Description
Project based learning	Development of a practical project of analysis and modeling of a technological, social, biological or economic network. It will consist in the structural and dynamic explanation of the observable phenomena in the data that describe the network. Through this methodology, competencies CB1, CB3, CG4, CG8, CE26 and CE27 are developed.
Autonomous problem solving	Autonomous resolution of problems and exercises related to the contents taught in the lectures. Through this methodology, competencies CB1, CB3, CG4, CG8, CE26 and CE27 are developed.
Lecturing	Synthetic exposition of the basic concepts that support the subject. Through this methodology, competencies CB1, CB3, CG4, CG8, CE26 and CE27 are developed.

Personalized assistance

Methodologies	Description
Lecturing	Individual attention to the students to solve the doubts that may arise in the study of the material of the lectures.
Project based learning	Individual attention to students to solve the doubts that may arise in the development of the project.
Autonomous problem solving	Individual attention to students to solve the doubts that may arise in the autonomous resolution of the problems.

Assessment

	Description	Qualification	Training	Learning Results
Project based learning	Functional test of the project and quality of the conclusions.	30	A1 A3	B4 B8 C26 C27
Autonomous problem solving	Correction of the proposed exercises.	30	A1 A3	B4 B8 C26 C27
Essay questions exam	Written exam of essay questions about the contents of the subject.	30	A1 A3	B4 B8 C26 C27

Objective questions exam	Written exam of objective questions about the contents of the subject.	10	A1 A3	B4 B8	C26 C27
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Other comments on the Evaluation

We leave to discretion of the students two methods of alternative assessment in the subject: continuous assessment and single assessment.

The continuous assessment will consist in the realisation of a written final exam (40% of the qualification), the development of a practical project (30% of the qualification) and the written resolution of problems and exercises along the course (30% of the qualification). The single assessment will consist in the realisation of a written final exam (60% of the qualification) and in the development of a practical project (40% of the qualification) that will be delivered before the last day of the official period of exams.

The students will choose one or another modality of assessment at the time when the development projects are announced.

All those students who attend the written final exam and/or deliver the project will be considered as presented.

Those students who do not pass the subject at the first call have a second call in the month of July in which his/her knowledge will be re-evaluated with a written exam and/or his/her project will be re-evaluated if it had been improved or modified. The weights of each one of the tests (exam and project) will be the same that in the ordinary period of exams according to the modality that had been chosen.

The qualifications of the tests have only effects in the academic course in that they were awarded, with independence of the itinerary of evaluation chosen.

Sources of information

Basic Bibliography

M. O. Jackson, **Social and economic networks**, Princeton University Press, 2010

M. Newman, **Networks**, OUP Oxford, 2018

A.-L. Barabasi, **Network science**, Cambridge University Press, 2016

Complementary Bibliography

R. van der Hofstad, **Random graphs and complex networks**, Cambridge University Press, 2016

D. Easley, J. Kleinberg, **Networks, Crowds, and Markets: Reasoning About a Highly Connected World**, Cambridge University Press, 2010

B. Bollobas, **Random Graphs**, Cambridge University Press, 2001

Recommendations

Contingency plan

Description

In case of online tuition, the same methodologies will be used and the same proofs will be carried out that would have been developed in classroom at School.

Online tuition will be supported by Campus Remoto and Faitic.
