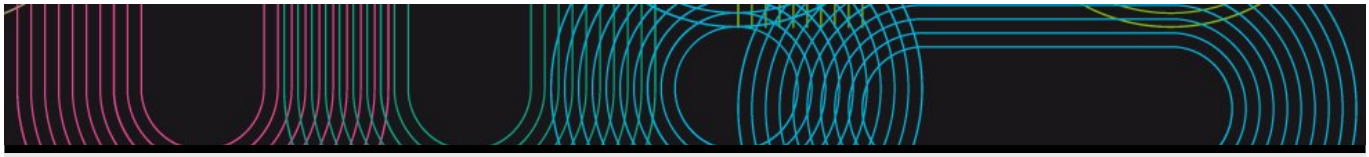

| IDENTIFYING DATA | | | | |
|---|---|---|---|---|
| **Economical and Social Networks** | | | | |
| Subject | Economical and Social Networks | | | |
| Code | V05M145V01323 | | | |
| Study programme | Máster Universitario en Ingeniería de Telecomunicación | | | |
| Descriptors | ECTS Credits | Choose | Year | Quadmester |
| | 5 | Optional | 2nd | 1st |
| Teaching language | Spanish | | | |
| Department | | | | |
| Coordinator | Sousa Vieira, Estrella | | | |
| Lecturers | Sousa Vieira, Estrella | | | |
| E-mail | estela@det.uvigo.es | | | |
| Web | http://moovi.uvigo.gal | | | |
| 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. | | | |

| Training and Learning Results | |
|---|---|
| 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 |

| Expected results from this subject | |
|---|---|
| Expected results from this subject | Training and Learning Results |
| Understand the static and dynamic phenomena that explain the structure of the social networks | B4<br>C26 |
| Know how to analyse the mechanisms of training of networks in strategic terms | B4<br>B8<br>C26<br>C27 |
| Know how to model and apply to real data the processes of diffusion of information in social networks | A1<br>A3<br>C26<br>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<br>A3<br>B4<br>B8<br>C26<br>C27 |
| Know how to use the dynamics of learning in networks to characterise phenomena | A1<br>A3<br>B4<br>C27 |

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

**Planning**

| | Class hours | Hours outside the classroom | Total hours |
|---|---|---|---|
| Project based learning | 4.5 | 36.5 | 41 |
| Autonomous problem solving | 4.5 | 22.5 | 27 |
| Lecturing | 18 | 36 | 54 |
| 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 or economic network. It will consist in the structural and dynamic explanation of the observable phenomena in the data that describe the network.<br><br>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.<br><br>Through this methodology, competencies CB1, CB3, CG4, CG8, CE26 and CE27 are developed. |
| Lecturing | Synthetic exposition of the basic concepts that support the subject.<br><br>Through this methodology, competencies CB1, CB3, CG4, CG8, CE26 and CE27 are developed. |

**Personalized assistance**

| **Methodologies** | **Description** |
|---|---|
| Lecturing | Individual attention to students to solve the doubts that may arise in the study of the material of the lectures. Tutoring sessions can be seen and/or requested in Moovi (https://moovi.uvigo.ga/user/profile.php?id=11585) |
| Project based learning | Individual attention to students to solve the doubts that may arise in the development of the project. Tutoring sessions can be seen and/or requested in Moovi (https://moovi.uvigo.ga/user/profile.php?id=11585) |
| Autonomous problem solving | Individual attention to students to solve the doubts that may arise in the autonomous resolution of the problems. Tutoring sessions can be seen and/or requested in Moovi (https://moovi.uvigo.ga/user/profile.php?id=11585) |

## Assessment

| | Description | Qualification | Training and Learning Results | | |
|---|---|---|---|---|---|
| Project based learning | Functional test of the project and quality of the conclusions. | 30 | A1<br>A3 | B4<br>B8 | C26<br>C27 |
| Autonomous problem solving | Correction of the proposed exercises. | 30 | A1<br>A3 | B4<br>B8 | C26<br>C27 |
| Essay questions exam | Written exam of essay questions about the contents of the subject. | 30 | A1<br>A3 | B4<br>B8 | C26<br>C27 |
| Objective questions exam | Written exam of objective questions about the contents of the subject. | 10 | A1<br>A3 | B4<br>B8 | C26<br>C27 |

## Other comments on the Evaluation

We leave to discretion of the students two methods of alternative assessment in the subject: continuous assessment (by default) and global 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 in three deliveries along the course (30% of the qualification). The global 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).

It is necessary to reach 3.5 points out of 10 in the written final exam to pass the subject. In case of not reaching this minimum but reaching or exceeding 5 points in the total qualification, the received qualification will be 4.5.

The students will be able to renounce the continuous assessment before the third delivery of problems and exercises, informing the teachers about it.

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 ordinary call have a extraordinary call 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