Networks, Crowds, and Markets (22996)

Degree/study: ADE/ECO/IBE
Course: third and fourth
Term: first
Number of ECTS credits: 5 credits
Hours of student's dedication: 125 hours
Language or languages of instruction: english
Professor: Joan de Martí

Presentation of the subject

Nowadays, networks are pervasive and influence many of our decisions and outcomes, both at the individual and aggregate level. A large body of academic literature has come up trying to understand the effect of networks in different economic contexts, often based on existing sociological theories on networks, crowds, behavior and information diffusion. The objective of this course is to give students an introduction to this emerging area. The ideas, models, and methods from this course are useful in different contexts and can be particularly relevant for students who want to pursue careers in information related industries.

The course is interdisciplinary and will cover elements from economics, marketing, operations research, computer science, and sociology.

The course is rigorous and rather mathematical; we study models, algorithms, and their analysis. Students are expected to know the mathematics covered in Mates 1,2, 3 as well as Probability and Statistics. The textbook by Easley and Kleinberg can give you an idea of the level of mathematics expected.

Competences to be attained

GENERAL SKILLS

Instrumental:

- Ability to analyze and synthesize

- Ability to organize and plan

- General basic mathematical knowledge

- Problem solving

- Written and spoken capabilities

Interpersonal:

- Criticism

<u>Systemic</u>:

- Learning capacities

- Research abilities

- Autonomous work

- Ability to generate new ideas (creativity)

<u>Other</u>:

- Written and oral communication abilities using a specialized language (mathematics)

SPECIFIC SKILLS

- Model formalization of different settings through mathematical language
- Solutions of mathematical models
- Knowledge of basic tools in mathematical analysis and linear algebra and their applications to economics and business

Assessment

The grading is based on the following components.

Final Exam: 60%
The final exam will take place at the end of the quarter and will last for two hours. The exam will cover all the material discussed and taught in class and in the seminars, as well as the recommended reading and the problem sets. It will cover both theoretical and practical aspects of the material. It counts 60% of the final grade.

A necessary, but not sufficient condition to pass the course, is that students must have a score on the final exam of at least 4 out of the total 10.

Continuous Evaluation: 40%
This part of the grade will be based on the evaluation of all the activities that will take place during the quarter: problem sets, participation in the seminars (including solving and discussing practice problems), and at least one presentation based on individual study.

The grading of the specific components is:

1. Problem-solving and seminars: **24%.** There will be short quizzes throughout the course testing class preparation and understanding. The first quiz will be during seminar 1 based on the material during the first two weeks. You are expected to hand in problem set solutions but they will not be graded. The instructor might cold-call during the seminars to answer a short quiz question or explain your homework solution.
2. Presentations: **16%.** Groups of three students are expected to make a short presentation (25 minutes max.) based on individual study and research. The presentations will start in the 2nd or 3rd seminar and there will be two to three presentations during each seminar class. The topics will be assigned by the instructors.

Final Grade: The final grade that will enter your official record is a score from 0-10 (fractional values allowed). This grade will be given as follows: The total based on the Final Exam and Continuous evaluation will be calculated as a weighted average with the weights as described above. The entire class will be sorted based on this total.
The assignment of the final grades is entirely at the discretion of the instructor, but will respect the ranking by weighted average. The grade may or may not be a translation of your weighted average (eg: 6.35 does not mean an automatic grade of 6.35, but could be stepped down to 5.5 or 6 ("suficient") or may be moved up to a 7 ("notable") according to the difficulty of the exams.

Make-up final Exam:
If you get a final grade below 5.0 , it is considered a fail and you have to take a make-up exam. In the make-up exam the grade will be calculated in the following manner. The make-up exam final grade will count for 80%. The other 20% will be based on your class performance. The date of the make-up exam will be posted on Aula Global.

Bibliography and teaching resources

Basic bibliography

Networks, Crowds, and Markets: Reasoning About a Highly Connected World by David Easley and Jon Kleinberg

There is a pre-production version of this book freely available on the authors' web.

Additional bibliography

Social and Economic Networks by M. Jackson

Networks: An Introduction by M. Newman

Social Network Analysis: Methods and Applications by S. Wasserman and K. Faust

Other teaching resources

Articles related to the topics covered in class taken from press, specialized journals, and/or blogs.

Course Outline

1. Concrete Examples
2. Graph Theory and Social Networks
3. Game Theory
4. Networks, Markets, and Strategic Interaction
5. Institutions and Aggregate Behavior
6. Network Dynamics: Population Models
7. Network Dynamics: Structural Models
8. Network Formation
9. Econometrics and Social Networks

Methodology

Students are supposed to do the following weekly assignments:

- Attending the (theoretical) classes
- Individual study: solving and reviewing problems, reviewing the material taught in the class and the textbook or in other related references.
- Before attending the seminars: answering the problem sets questions.
- Attending the seminars and handing in the assigned problem sets.

Class Rules

No plagiarism, cheating or copying will be tolerated. If detected, the grades of all involved parties may be reduced down to Fail and reported to the Dean's office.

Activities Planning

Seminars will start the 5th week of the course. Group presentations will start by the second or third seminar session.