GHENT UNIVERSITY

Course Specifications

Valid as from the academic year 2023-2024

Networks in Socio-Economic Systems (F000920)

Course size *(nominal values; actual values may depend on programme)*

Credits 6.0 **Study time 180 h**

Course offerings and teaching methods in academic year 2023-2024

A (semester 2)	English	Gent	seminar
			lecture

Lecturers in academic year 2023-2024

Correa da Rocha, Luis Enrique	EB21	lecturer-in-charge

Offered in the following programmes in 2023-2024	**crdts**	**offering**
Master of Science in Business Economics (main subject Accountancy)	6	A
Master of Science in Business Economics (Double Degree)(main subject Accountancy)	6	A
Master of Science in Business Economics (Double Degree)(main subject Corporate Finance)	6	A
Master of Science in Business Economics (main subject Corporate Finance)	6	A
Master of Science in Business Engineering(main subject Data Analytics)	6	A
Master of Science in Business Engineering (Double Degree)(main subject Finance)	6	A
Master of Science in Business Engineering(main subject Finance)	6	A
Master of Science in Business Economics (Double Degree)(main subject Marketing)	6	A
Master of Science in Business Economics (main subject Marketing)	6	A
Master of Science in Business Engineering (Double Degree)(main subject Operations Management)	6	A
Master of Science in Business Engineering(main subject Operations Management)	6	A
Master of Science in Economics	6	A
Master of Science in Economics (Double Degree)	6	A
Exchange programme in Economics and Business Administration	6	A

Teaching languages

English

Keywords

complex systems; complexity; complex networks; social networks; human behaviour; socio-economic systems; data science; data analytics; modelling; agent-based.

Position of the course

This course introduces fundamental and state-of-the-art network science tools, and aims to guide students in the application of network modelling and analytics to real-world data to study socio-economic problems from a system's perspective, e.g. social and communication networks, interbank lending, trade and transportation networks, innovation, collaboration, opinions, migration, mobility, among others.

Contents

The course covers a spectrum of network data modelling and analytic quantitative techniques relevant to study socio-economic systems. The course is divided in three parts.

Part 1. Fundamentals of Network Science.
This part introduces elementary mathematical and computational network methods and concepts such as network modelling, data representation, and network visualisation. It also introduces elementary algorithms to extract information from network data, e.g. node degree, clustering, motifs, paths, centrality, core-periphery, assortativeness.

Part 2. Processes on Networks.
This part introduces techniques to model dynamic processes on networks, as for example diffusion of information (e.g. opinions, rumours), epidemics, network attacks, failures and cascades.

Part 3. Advanced Network Analytics.
This part introduces advanced analytic methods, e.g. community detection, temporal networks, and network sampling.

Initial competences

Quantitative mindset, basic mathematical knowledge (i.e. probability and statistics, matrices), computer literacy, and familiarity with one computer programming language (e.g. Python, R, C/C++, Matlab, Java, or Scilab).

Final competences

1 Identify and critically analyse socio-economic problems from a system's perspective.
2 Select network methods for a particular network data analytics task.
3 Implement a network data analysis project using network tools in Python.
4 Manage collaborative data analysis projects
5 Presenting professional and convincing data analytics reports.
6 Reflecting on own learning process and that of peers.

Conditions for credit contract

Access to this course unit via a credit contract is unrestricted: the student takes into consideration the conditions mentioned in 'Starting Competences'

Conditions for exam contract

Access to this course unit via an exam contract is unrestricted

Teaching methods

Seminar, Lecture

Extra information on the teaching methods

Enquiry-based learning. Teaching and learning are student-centred and based on social constructivism. Lectures and workshops include group work, and workshops include guided self-study.
Journal club, discussions, peer-assessment

Learning materials and price

- M Newman (2010). Networks: An Introduction. Oxford University Press, UK. ISBN 01992066. Available at the Ugent libraries.
- DataCamp (2019). Python tutorial.
Freely available at: http://www.learnpython.org (Accessed 14.11.2019)
- NetworkX Developers. NetworkX Documentation & Tutorial (2019)
Freely available at http://networkx.github.io/documentation/stable/ (Accessed 14.11.2019)
- Slides will be available online (Ufora)

References

- A-L Barabasi (2016). Network Science. Cambridge University Press, UK. ISBN 1107076269
- MO Jackson (2010). Social and Economic Networks. Princeton University Press, USA. ISBN 0691148201
- D Easley and J Kleinberg (2010). Networks, Crowds, and Markets: Reasoning about a Highly Connected World. Cambridge University Press, UK. ISBN 0521195330
- B Hogan (2017). Online social networks: Concepts for data collection in: The SAGE Handbook of online research methods. Sage Thousand Oaks, CA, USA.
- Google Education (2019). Introduction to Python.
Freely available at: http://developers.google.com/edu/python/ (Accessed 14.11.2019)

Course content-related study coaching

Interactive online counselling (email), individual and group support via appointment.

Assessment moments

continuous assessment

Examination methods in case of periodic assessment during the first examination period

Examination methods in case of periodic assessment during the second examination period

Examination methods in case of permanent assessment

Oral assessment, Peer and/or self assessment, Assignment

Possibilities of retake in case of permanent assessment

examination during the second examination period is not possible

Extra information on the examination methods

a. 1st summative assessment after the 1st part of the course (around week 7)
b. 2nd summative assessment after the 3rd part of the course (around week 15)
c. 3rd summative assessment after the 3rd part of the course (around week 15)
Final mark = a*0.5 + b*0.3 + c*0.2
Further information can be found on ufora.

Calculation of the examination mark

Final mark = a*0.5 + b*0.3 + c*0.2
- The pass mark is 50 for all assessments.
- Active participation in the group project and presentation is mandatory. If not, individual marks can be reduced.
- Deadlines must be respected. If not, marks can be reduced.

Facilities for Working Students

Lab attendance is not mandatory. Online feedback.