

**1. General information****Course:** COMPUTATIONAL MODELS FOR INFORMATION SYSTEMS**Type:** ELECTIVE**Degree:** 405 - DEGREE IN COMPUTER SCIENCE ENGINEERING (TA)**Center:** 15 - FACULTY OF SOCIAL SCIENCES AND INFORMATION TECHNOLOGIES**Year:** 4**Main language:** Spanish**Use of additional languages:****Web site:** <https://campusvirtual.uclm.es>**Code:** 42410**ECTS credits:** 6**Academic year:** 2022-23**Group(s):** 60**Duration:** C2**Second language:****English Friendly:** Y**Bilingual:** N**Lecturer:** ALFONSO NIÑO RAMOS - Group(s): 60

Building/Office	Department	Phone number	Email	Office hours
2.11	TECNOLOGÍAS Y SISTEMAS DE INFORMACIÓN	6474	alfonso.nino@uclm.es	Available at https://www.uclm.es/toledo/fcsociales/grado-informatica/profesorado-y-tutorias

2. Pre-Requisites

This course is based (but does not depend) on the competencies and knowledge obtained in the previous courses:

- Programming Fundamentals I
- Programming Fundamentals II
- Calculus and Numerical Methods
- Algebra and Discrete Mathematics
- Data Structures
- Programming Methodology

3. Justification in the curriculum, relation to other subjects and to the profession

The use of the network model for describing and treating complex systems is a huge change of paradigm introduced in this century. This model represents a powerful way of organizing, processing, and interpreting the data plethora generated nowadays as a consequence of the operation or analysis of corporative, technological, or natural systems. Its application to the treatment of social, communication, economic or genomic networks, among others, provides an opportunity for new business models. In addition, this approach offers an increase in the competitiveness and operative capability of corporations, organizations, and government agencies. This course presents the foundations of the network model and the algorithmic techniques that allow generating knowledge from the information extracted from the networks.

4. Degree competences achieved in this course**Course competences**

Code	Description
BA01	Ability to solve mathematical problems which can occur in engineering. Skills to apply knowledge about: lineal algebra; integral and differential calculus; numerical methods, numerical algorithms, statistics, and optimization.
CB03	Be able to gather and process relevant information (usually within their subject area) to give opinions, including reflections on relevant social, scientific or ethical issues.
CB04	Transmit information, ideas, problems and solutions for both specialist and non-specialist audiences.
CM05	Ability to acquire, formalise, and represent human knowledge in a computable form for the solution of problems throughout a digital system in any application context, especially the one linked to computational aspects, perception, and behaviour in intelligent frames.
CO13	Knowledge and application of the required tools for the storage, process, and access to informational systems, even web based ones.
INS04	Problem solving skills by the application of engineering techniques.
PER01	Team work abilities.
SI01	Ability to integrate information and communication technology solutions and entrepreneurial process so as to fulfil the needs for information in organisation, allowing them to meet their goals in an effective and efficient manner, providing them with competitive benefits.
SIS08	Initiative and entrepreneurial abilities.
UCLM02	Ability to use Information and Communication Technologies.

5. Objectives or Learning Outcomes**Course learning outcomes****Description**

- Ability to debate and discuss, in a reasoned manner, the issues and problems involved in the business decision-making process from a quantitative perspective.
- Ability to analyse the robustness of networked systems such as communication networks or the financial system.
- Ability to determine and interpret the characteristic structural parameters of networked systems.
- Selection and management of required algorithms to determine the structure of communities and dynamics of networked systems.
- Ability to use tools and develop applications and services that process information and provide intelligence to the environment of organisations.

6. Units / Contents

Unit 1: Networked complex systems. General concepts

Unit 2: Network models

Unit 3: Community detection in networks

Unit 4: Spreading processes in networks

Unit 5: Network robustness

Unit 6: Network dynamics

7. Activities, Units/Modules and Methodology

Training Activity	Methodology	Related Competences (only degrees before RD 822/2021)	ECTS	Hours	As	Com	Description
Class Attendance (theory) [ON-SITE]	Lectures	BA01 CB03 INS04 SI01	0.72	18	N	-	Teaching of the subject matter by lecturer
Individual tutoring sessions [ON-SITE]		BA01 CB03 CB04 SIS08 UCLM02	0.18	4.5	N	-	Individual or small group tutoring in lecturer's office, classroom or laboratory
Study and Exam Preparation [OFF-SITE]	Self-study	BA01 CB03 CM05 CO13 INS04 SI01 SIS08 UCLM02	2.1	52.5	N	-	Self-study
Other off-site activity [OFF-SITE]	Practical or hands-on activities	BA01 CM05 CO13 INS04 PER01 SI01 SIS08 UCLM02	0.6	15	N	-	Lab practical preparation
Problem solving and/or case studies [ON-SITE]	Problem solving and exercises	BA01 CB03 CM05 INS04 SI01 SIS08 UCLM02	0.6	15	Y	N	Worked example problems and cases resolution by the lecturer and the students
Writing of reports or projects [OFF-SITE]	Self-study	BA01 CB03 CB04 CM05 CO13 INS04 SI01 SIS08 UCLM02	0.9	22.5	Y	N	Preparation of essays on topics proposed by lecturer
Laboratory practice or sessions [ON-SITE]	Practical or hands-on activities	INS04 PER01 SI01 SIS08 UCLM02	0.6	15	Y	Y	Realization of practicals in laboratory /computing room
Other on-site activities [ON-SITE]	Assessment tests	BA01 CM05 INS04 SI01 SIS08 UCLM02	0.3	7.5	Y	Y	Final exam including all topics
Total:			6	150			
Total credits of in-class work: 2.4			Total class time hours: 60				
Total credits of out of class work: 3.6			Total hours of out of class work: 90				

As: Assessable training activity

Com: Training activity of compulsory overcoming (It will be essential to overcome both continuous and non-continuous assessment).

8. Evaluation criteria and Grading System

Evaluation System	Continuous assessment	Non-continuous evaluation*	Description
Final test	50.00%	50.00%	Compulsory activity that can be retaken (rescheduling) to be carried out within the planned exam dates of the final exam call (convocatoria ordinaria)
Theoretical papers assessment	15.00%	15.00%	Non-compulsory activity that can be retaken. To be carried out before end of teaching period
Laboratory sessions	25.00%	25.00%	Compulsory activity that can be retaken. To be carried out during lab sessions
Oral presentations assessment	10.00%	10.00%	Non-compulsory activity that can be retaken. To be carried out during the theory/lab sessions
Total:	100.00%	100.00%	

According to art. 4 of the UCLM Student Evaluation Regulations, it must be provided to students who cannot regularly attend face-to-face training activities the passing of the subject, having the right (art. 12.2) to be globally graded, in 2 annual calls per subject, an ordinary and an extraordinary one (evaluating 100% of the competences).

Evaluation criteria for the final exam:

Continuous assessment:

In compulsory activities, a minimum mark of 40% is required in order to pass that activity and have the possibility to therefore pass the entire subject. The evaluation of the activities will be global and therefore must be quantified by means of a single mark. If the activity consists of several sections, each section may be evaluated separately provided students are informed in writing of this evaluation criterion at the beginning of the academic year. In the case of the activities that may be retaken (i.e., rescheduling), an alternative activity or test will be offered in the resit/retake exam call (convocatoria extraordinaria). The final exam will be common for all the theory/laboratory groups of the subject and will be evaluated by the lecturers of the subject in a serial way, i.e., each part of the final exam will be evaluated by the same lecturer for all the students.

A student is considered to pass the subject if she/he obtains a minimum of 50 points out of 100, taking into account the points obtained in all the evaluable activities, and also have passed all the compulsory activities.

For students who do not pass the subject in the final exam call (convocatoria ordinaria), the marks of activities already passed will be conserved for the resit/retake exam call (convocatoria extraordinaria). If an activity is not recoverable, its assessment will be preserved for the resit/retake exam call (convocatoria extraordinaria) even if it has not been passed. In the case of the passed recoverable activities, the student will have the opportunity to receive an alternative evaluation of those

activities in the resit/retake exam call and, in that case, the final grade of the activity will correspond to the last grade obtained.

The mark of the passed activities in any call, except for the final exam, will be conserved for the subsequent academic year at the request of the student, provided that mark is equal or greater than 50% and that the activities and evaluation criteria of the subject remain unchanged prior to the beginning of that academic year.

The failure of a student to attend the final exam will automatically result in her/him receiving a "Failure to attend" (no presentado). If the student has not passed any compulsory evaluation activity, the maximum final grade will be 40%

Non-continuous evaluation:

Students who are unable to attend training activities on a regular basis may apply at the beginning of the semester for the non-continuous assessment mode. Similarly, if a student who is undergoing continuous assessment incurs any circumstance that prevents her/him from regularly attending the classroom-based training activities, she/he may renounce the accumulated mark in continuous assessment and apply for the non-continuous assessment mode.

In the same way, the student may change to the non-continuous evaluation mode as long as she/he has not participated during the teaching period in evaluable activities that together account for at least 50% of the total mark of the subject. If a student has reached this 50% of the total obtainable mark, or the teaching period is over, she/he will be considered in continuous assessment without the possibility of changing to non-continuous evaluation mode.

Students who take the non-continuous assessment mode will be globally graded, in 2 annual calls per subject, an ordinary and an extraordinary one (evaluating 100% of the competences), through the assessment systems indicated in the column "Non-continuous assessment".

In the "non-continuous assessment" mode, it is not compulsory to keep the mark obtained by the student in the activities or tests (progress test or partial test) taken in the continuous assessment mode.

Specifications for the resit/retake exam:
 Evaluation tests will be conducted for all recoverable activities

Specifications for the second resit / retake exam:
 Same characteristics as the resit/retake exam call

9. Assignments, course calendar and important dates	
Not related to the syllabus/contents	
Hours	hours
General comments about the planning: The subject is taught in 3 x 1,5 hour sessions per week. The planning can be modified in the event of unforeseen causes.	

10. Bibliography and Sources						
Author(s)	Title/Link	Publishing house	City	ISBN	Year	Description
Albert-László Barabási	Network Science http://networksciencebook.com/	Cambridge University Press		978-1107076266	2016	
M. E. J. Newman	Networks: An Introduction	Oxford University Press		978-0198805090	2018	
Kayhan Erciyes	Complex Networks: An Algorithmic Perspective	CRC Press		978-1466571662	2014	