



POLITÉCNICA

INTERNATIONAL
CAMPUS OF
EXCELLENCE

COORDINATION PROCESS OF
LEARNING ACTIVITIES
PR/CL/001



E.T.S. de Ingenieros
Informáticos

ANX-PR/CL/001-01

LEARNING GUIDE

SUBJECT

103000892 - Data Visualization

DEGREE PROGRAMME

10BA - Master Universitario En Ciencia De Datos

ACADEMIC YEAR & SEMESTER

2021/22 - Semester 1

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1. Description

1.1. Subject details

Name of the subject	103000892 - Data Visualization
No of credits	3 ECTS
Type	Compulsory
Academic year of the programme	First year
Semester of tuition	Semester 1
Tuition period	September-January
Tuition languages	English
Degree programme	10BA - Master Universitario en Ciencia de Datos
Centre	10 - Escuela Tecnica Superior De Ingenieros Informaticos
Academic year	2021-22

2. Faculty

2.1. Faculty members with subject teaching role

Name and surname	Office/Room	Email	Tutoring hours *
Pablo Toharia Rabasco (Subject coordinator)	4102	pablo.toharia@upm.es	Sin horario.
Antonio Latorre De La Fuente	4202	a.latorre@upm.es	Sin horario.

* The tutoring schedule is indicative and subject to possible changes. Please check tutoring times with the faculty member in charge.

3. Skills and learning outcomes *

3.1. Skills to be learned

CB06 - Poseer y comprender conocimientos que aporten una base u oportunidad de ser originales en el desarrollo y/o aplicación de ideas, a menudo en un contexto de investigación

CB07 - Que los estudiantes sepan aplicar los conocimientos adquiridos y su capacidad de resolución de problemas en entornos nuevos o poco conocidos dentro de contextos más amplios (o multidisciplinares) relacionados con su área de estudio

CB08 - Que los estudiantes sean capaces de integrar conocimientos y enfrentarse a la complejidad de formular juicios a partir de una información que, siendo incompleta o limitada, incluya reflexiones sobre las responsabilidades sociales y éticas vinculadas a la aplicación de sus conocimientos y juicios

CB09 - Que los estudiantes sepan comunicar sus conclusiones y los conocimientos y razones últimas que las sustentan a públicos especializados y no especializados de un modo claro y sin ambigüedades

CB10 - Que los estudiantes posean las habilidades de aprendizaje que les permitan continuar estudiando de un modo que habrá de ser en gran medida autodirigido o autónomo.

CECD04 - Capacidad para aplicar técnicas para la generación de visualizaciones adecuadas a cada problema para el análisis y la exploración de datos, y para la correcta comunicación de los resultados del análisis.

CG06 - Especificación y realización de tareas informáticas complejas, poco definidas o no familiares

CG07 - Aplicación de los últimos o más novedosos métodos para resolver problemas que, posiblemente, involucren a otras disciplinas

CG08 - Capacidad de pensamiento de forma creativa para desarrollar aproximaciones y métodos nuevos y originales

CG09 - Integración del conocimiento de distintos campos de estudio

CG10 - Apreciación de los límites del conocimiento actual y de la aplicación práctica de la última tecnología

CG11 - Conocimiento y comprensión de la informática para crear modelos, así como sistemas y procesos de información complejos

CGI01 - Adquirir conocimientos científicos avanzados del campo de la informática que le permitan generar nuevas

ideas dentro de una línea de investigación

CGI02 - Comprender el procedimiento, valor y límites del método científico en el campo de la Informática, siendo capaz de identificar, localizar y obtener datos requeridos en un trabajo de investigación, de diseñar y guiar investigaciones analíticas, de modelado y experimentales, así como de evaluar datos de una manera crítica y extraer conclusiones

CGI03 - Capacidad para valorar la importancia de las fuentes documentales, manejarlas y buscar la información para el desarrollo de cualquier trabajo de investigación

CGI04 - Capacidad de leer y comprender publicaciones dentro de su ámbito de estudio/investigación, así como su catalogación y valor científico

3.2. Learning outcomes

RA17 - Conocer los fundamentos de las técnicas de visualización analítica

RA18 - Aprender y aplicar la metodología de diseño de las herramientas de visualización analítica

* The Learning Guides should reflect the Skills and Learning Outcomes in the same way as indicated in the Degree Verification Memory. For this reason, they have not been translated into English and appear in Spanish.

4. Brief description of the subject and syllabus

4.1. Brief description of the subject

This course will allow the student to gain the fundamentals for the visualization of all kinds of information. With an eminently practical approach, the technologies and fundamentals necessary to create successful information visualization tools will be presented.

4.2. Syllabus

1. Introduction to Visual Analytics
2. Data abstractions
3. Tasks abstractions
4. Fundamentals of visual encoding
5. Arrange tabular datasets
6. Arrange spatial datasets
7. Arrange networks
8. Map color and other channels
9. Manipulate view
10. Facet into multiple views
11. Reduce data
12. Embed: Focus+Context

5. Schedule

5.1. Subject schedule*

Week	Face-to-face classroom activities	Face-to-face laboratory activities	Distant / On-line	Assessment activities
1	Course introduction Duration: 03:00		Course introduction Duration: 03:00	
2				
3				
4				
5				
6				
7				
8				
9	Lesson 1 Duration: 02:00	Practical Work Duration: 01:00	Lesson 1 Duration: 02:00 Practical Work Duration: 01:00	
10	Lesson 2 Duration: 01:00 Lesson 3 Duration: 01:00	Practical Work Duration: 01:00	Lesson 2 Duration: 01:00 Practical Work Duration: 01:00 Lesson 3 Duration: 01:00	
11	Lesson 4 Duration: 02:00	Practical Work Duration: 01:00	Lesson 4 Duration: 02:00 Practical Work Duration: 01:00	
12	Lesson 5 Duration: 01:00 Lesson 6 Duration: 01:00	Practical Work Duration: 01:00	Lesson 5 Duration: 01:00 Practical Work Duration: 01:00 Lesson 6 Duration: 01:00	

13	Lesson 7 Duration: 01:00 Lesson 8 Duration: 01:00	Practical Work Duration: 01:00	Lesson 7 Duration: 01:00 Practical Work Duration: 01:00 Lesson 8 Duration: 01:00	
14	Lesson 9 Duration: 01:00 Lesson 10 Duration: 01:00	Practical Work Duration: 01:00	Lesson 9 Duration: 01:00 Practical Work Duration: 01:00 Lesson 10 Duration: 01:00	
15	Lesson 11 Duration: 01:00	Practical Work Duration: 02:00	Lesson 11 Duration: 01:00 Practical Work Duration: 02:00	
16	Lesson 12 Duration: 01:00	Practical Work Duration: 02:00	Lesson 12 Duration: 01:00 Practical Work Duration: 02:00	Assignment Deadline Continuous assessment and final examination Not Presential Duration: 00:00
17				Final Exam Continuous assessment and final examination Presential Duration: 02:00

Depending on the programme study plan, total values will be calculated according to the ECTS credit unit as 26/27 hours of student face-to-face contact and independent study time.

* The schedule is based on an a priori planning of the subject; it might be modified during the academic year, especially considering the COVID19 evolution.

6. Activities and assessment criteria

6.1. Assessment activities

6.1.1. Continuous assessment

Week	Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
16	Assignment Deadline		No Presential	00:00	80%	4 / 10	CB09 CB08 CGI01 CG08 CB06 CG06 CG09 CG07 CGI03 CB07 CB10 CG11 CG10 CECD04 CGI04 CGI02
17	Final Exam		Face-to-face	02:00	20%	4 / 10	CB06 CG06 CG09 CG07 CGI03 CB07 CB10 CG11 CG10 CECD04 CGI04 CGI02 CB09

6.1.2. Final examination

Week	Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
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16	Assignment Deadline		No Presential	00:00	80%	4 / 10	CB09 CB08 CGI01 CG08 CB06 CG06 CG09 CG07 CGI03 CB07 CB10 CG11 CG10 CECD04 CGI04 CGI02
17	Final Exam		Face-to-face	02:00	20%	4 / 10	CB06 CG06 CG09 CG07 CGI03 CB07 CB10 CG11 CG10 CECD04 CGI04 CGI02 CB09

6.1.3. Referred (re-sit) examination

No se ha definido la evaluación extraordinaria.

6.2. Assessment criteria

Continuous evaluation

This section covers the evaluation criteria for this course. All the students enrolled in this course will be subject, by default, to the continuous evaluation scheme. For this reason, this learning guide will be focused on this approach and it details all the evaluation activities in the timeline of the course. Those students interested in the final examination evaluation scheme are referred to the next section of this document.

This course will be evaluated in two ways:

- **Final exam.** At the end of the course, there will be a final exam covering all the contents presented during the course.
- **Practical work.** This assignment will be presented during the course, at class, in the date detailed in the timeline of the course. There will be some classes devoted to this assignment, where the students will count with the support of the instructor, which should be, in general, complemented with autonomous work by the student. The deadline for the assignment will be fixed at the end of the term, as shown in the timeline of the course. No late assignments will be accepted for evaluation.

The **final grade** for this course will be computed as follows: 20% for the final exam 80% for the assignment. To pass the course, a **minimum score of 4** is required for each of these parts and a **grand mean** of 5 is needed combining these two items of evaluation.

Final exam evaluation

This evaluation scheme will be only offered if the current regulation of the UPM requires it and the procedure to opt for this type of evaluation will be subject to the instructions given by the school. Please, refer to <http://www.fi.upm.es/?pagina=1147> for additional information.

In general, the regulations for this evaluation scheme will be the same as for the continuous evaluation option. In particular:

- The students will have to conduct the same practical work without the in-class support of the instructors.
- The deadline for the assignment will be the same as for the continuous evaluation scheme.

Extraordinary evaluation in July

If the student does not succeed in this course, she/he will have to repeat those parts not passed in the ordinary evaluation. There will be a new call for the final exam as well as a new deadline common the assignment.

7. Teaching resources

7.1. Teaching resources for the subject

Name	Type	Notes
Book 1	Bibliography	Keim, D., Kohlhammer, J., Ellis, G., Mansmann, F. Mastering the information age. Solving problems with visual analytics 2010 Eurographics Association.
Book 2	Bibliography	Tamara Munzner. Visualization Analysis and Design. A K Peters Visualization Series. CRC Press. Nov. 2014.
Assigned class	Equipment	
Web site of the course	Web resource	UPM Moodle
Collaboration and meetings	Others	Microsoft Teams, Blackboard Collaborate, Zoom, Skype and other institutional tools available

8. Other information

8.1. Other information about the subject

This course is jointly offered with the EIT-Digital Master in Data Science and lectures are delivered in English.

The subject is related to SDG5.5 and SDG5.b.

The health situation caused by the COVID-19 pandemic forces to restrict the capacity of the classrooms and therefore it has been decided that the teaching of this semester will be of mixed presence. In-person shifts will be established within the groups, so that each week one shift will attend class in the classroom (columns "face-to-face activities" of the schedule), while the rest of the shifts will connect to the class remotely (column "Distance/On-line"). And each week it will be a different shift that goes to the classroom.

If sanitary conditions improve and face-to-face classes can be taught normally, all students will go to classrooms to receive the classes indicated in the columns "face-to-face activities".

If, on the contrary, the sanitary conditions worsened, all the students would go on to connect to the remote classes of the column "Distance/On-line". In this situation, the planned face-to-face continuous assessment tests would be performed online, without the need to modify this guide.