



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

103001004 - Data Visualization

DEGREE PROGRAMME

10AZ - Master Universitario En Innovación Digital

ACADEMIC YEAR & SEMESTER

2024/25 - Semester 1

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1. Description

1.1. Subject details

Name of the subject	103001004 - Data Visualization
No of credits	3 ECTS
Type	Optional
Academic year of the programme	First year
Semester of tuition	Semester 1
Tuition period	September-January
Tuition languages	English
Degree programme	10AZ - Master Universitario en Innovación Digital
Centre	10 - Escuela Tecnica Superior De Ingenieros Informaticos
Academic year	2024-25

2. Faculty

2.1. Faculty members with subject teaching role

Name and surname	Office/Room	Email	Tutoring hours *
Jorge Acosta Hernandez	4201	jorge.acosta@upm.es	Sin horario.
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.

CE-CD02 - Capacidad para aplicar técnicas para la generación de visualizaciones adecuadas para el análisis y la exploración de datos en un contexto determinado, y para la correcta comunicación de los resultados del análisis

CE-FT05 - Capacidad para aplicar técnicas para la generación de visualizaciones adecuadas para el análisis y la exploración de datos para resolver un determinado problema asociado a tecnologías financieras

CE-HMDA02 - Capacidad para aplicar técnicas para la generación de visualizaciones adecuadas para el análisis y la exploración de datos en un contexto médico, y para la correcta comunicación de los resultados del análisis

CE-HMDA03 - Capacidad para seleccionar las técnicas y herramientas para visualización de grandes cantidades de datos más adecuadas para resolver un determinado problema en el campo de la salud

CG06 - Capacidad para gestionar la información.

CG07 - Capacidad de trabajar y comunicarse también en contextos internacionales.

CG08 - La capacidad de traducir innovaciones en soluciones comerciales factibles.

CG09 - La capacidad de transformar las experiencias prácticas en problemas y desafíos de investigación.

3.2. Learning outcomes

RA122 - Know the basics of data visualization techniques

RA123 - Learn and apply the design methodology of visual analytics tools

* 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	Type 1 activities	Type 2 activities	Distant / On-line	Assessment activities
1	Course introduction Duration: 01:00 Lecture Lesson 1 Duration: 02:00 Lecture			
2	Lesson 2 Duration: 01:00 Lecture Lesson 3 Duration: 01:00 Lecture	Practical Work Duration: 01:00 Laboratory assignments		
3	Lesson 4 Duration: 02:00 Lecture	Practical Work Duration: 01:00 Laboratory assignments		
4	Lesson 5 Duration: 01:00 Lecture Lesson 6 Duration: 01:00 Lecture	Practical Work Duration: 01:00 Laboratory assignments		
5	Lesson 7 Duration: 01:00 Lecture Lesson 8 Duration: 01:00 Lecture	Practical Work Duration: 01:00 Laboratory assignments		
6	Lesson 9 Duration: 01:00 Lecture Lesson 10 Duration: 01:00 Lecture	Practical Work Duration: 01:00 Laboratory assignments		
7	Lesson 11 Duration: 01:00 Lecture	Practical Work Duration: 02:00 Laboratory assignments		
8	Lesson 12 Duration: 01:00 Lecture	Practical Work Duration: 02:00 Laboratory assignments		

9				
10				
11				
12				
13				
14				
15				Assignment Deadline Group work Progressive assessment and Global Examination Not Presential Duration: 00:00
16				
17	Final Exam Evaluación Progresiva y Global Duration: 03:00 Additional activities			Final Exam Written test Progressive assessment and Global Examination Presential Duration: 03:00

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.

6. Activities and assessment criteria

6.1. Assessment activities

6.1.1. Assessment

Week	Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
15	Assignment Deadline	Group work	No Presential	00:00	80%	4 / 10	CB06 CB07 CB08 CB09 CB10 CG06 CG07 CG08 CG09 CE-CD02 CE-HMDA02 CE-HMDA03 CE-FT05
17	Final Exam	Written test	Face-to-face	03:00	20%	4 / 10	

6.1.2. Global examination

Week	Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
15	Assignment Deadline	Group work	No Presential	00:00	80%	4 / 10	CB06 CB07 CB08 CB09 CB10 CG06 CG07 CG08 CG09 CE-CD02 CE-HMDA02 CE-HMDA03 CE-FT05
17	Final Exam	Written test	Face-to-face	03:00	20%	4 / 10	

6.1.3. Referred (re-sit) examination

Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
Final exam	Written test	Face-to-face	03:00	100%	/ 10	CB06 CB07 CB08 CB09 CB10 CG06 CG07 CG08 CG09 CE-HMDA02 CE-HMDA03 CE-FT05

6.2. Assessment criteria

Regular call

This section covers the evaluation criteria for this course. All the students enrolled in this course will be subject, by default, to the progressive 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.

The evaluation of the course will take into account both the theoretical knowledge acquired in the lectures and the knowledge assimilated after the practical work throughout the course.

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 delivery of the assignment is considered a mandatory activity in order to pass the course. Moreover, only its delivery will entitle the student to take the evaluation of the practical part,

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.

Extraordinary call

If the students do not succeed in this course, they 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 for the assignment with the same requirements as in the regular call.

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 other Master Programmes and lectures are delivered in English.

The chronogram follows a theoretical planning of the subject and may undergo modifications during the course.

This Learning Guide is the general reference for this course.

The actual information about its implementation in the current semester (calendar, schedule, dates, deadlines, weights, notices, lists, etc.), will be published in the moodle of the course. Any conflict, deficiency, inconsistency or discrepancy between the information in this guide and that published in the moodle must be resolved in favor of the latter.

The subject is related to:

SDG-4: Quality Education

SDG-5.5 Ensure women's full and effective participation and equal opportunities for leadership at all levels of decision-making in political, economic and public life

SDG-8: Decent Work and Economic Growth