ANX-PR/CL/001-01

LEARNING GUIDE

SUBJECT

103000372 - Seminars

DEGREE PROGRAMME

10AJ - Master Universitario En Inteligencia Artificial

ACADEMIC YEAR & SEMESTER

2021/22 - Semester 2

Index

Learning guide

1. Description

1.1. Subject details

Name of the subject	103000372 - Seminars
No of credits	10 ECTS
Type	Compulsory
Academic year ot the programme	First year
Semester of tuition	Semester 2
Tuition period	February-June
Tuition languages	English
Degree programme	10AJ - Master Universitario en Inteligencia Artificial
Centre	10 - Escuela Tecnica Superior De Ingenieros Informaticos
Academic year	2021-22

2. Faculty

2.1. Faculty members with subject teaching role

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* 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

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.

CB7 - 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

CB9 - 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

CG11 - Integración del conocimiento a partir de disciplinas diferentes, así como el manejo de la complejidad.

CG8 - Planteamiento y resolución de problemas también en áreas nuevas y emergentes de su disciplina

CG9 - Aplicación de los métodos de resolución de problemas más recientes o innovadores y que puedan implicar el uso de otras disciplinas.

CGI1 - Adquirir conocimientos científicos avanzados del campo de la informática que le permitan generar nuevas ideas dentro de una línea de investigación.

CGI3 - Capacidad para valorar la importancia de las fuentes documentales, manejarlas y buscar la información para el desarrollo de cualquier trabajo de investigación.

CGI4 - Capacidad de leer y comprender publicaciones dentro de su ámbito de estudio/investigación, así como su catalogación y valor científico.

CGI5 - Que el estudiante adquiera el conocimiento necesario sobre los mecanismos de financiación de la investigación y transferencia de la tecnología, y sobre la legislación vigente sobre protección de resultados

3.2. Learning outcomes

RA2 - Establecer un debate fundamentado sobre el conocimiento científico y las bases de la investigación

RA8 - Conocer el tipo de problemas que se pueden resolver con las disciplinas de la Inteligencia Artificial involucradas en las materias de las que forman parte dichos seminarios

RA4 - Valorar la importancia de las fuentes documentales y seleccionar aquéllas que sean más interesantes para publicar sus trabajos

RA6 - Ser capaz de elaborar documentos para difundir los resultados de la investigación de acuerdos con unas características específicas y dentro del estilo científico

RA7 - Capacidad de presentar en público los resultados de sus trabajos de investigación

RA5 - Buscar y recuperar la información documental para el desarrollo de cualquier trabajo de investigación

RA9 - Conocer las distintas técnicas de solución asociadas a los tipos de problemas que se pueden resolver con las disciplinas de la IA y sus límites

RA3 - Abordar los aspectos formales del proyecto inicial de una investigación

* 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

The student must attend **six seminars**. The seminars offered in the Master's degree course are all optional, except S1: Research Methodology, S2: Project Management and Risk Control and S3: Ethical and legal aspects of Artificial Intelligence, which are mandatory. All seminars are organised into three categories:

- Seminars whose name match the subject to which they belong (S5, S6, S7, S8 and S11). If the student decides not to be taught any module belonging to M2 to M6, then the student must take this seminar. In these seminars the student will acquire general knowledge about the respective subject.
- Seminars that complement modules (S4, S9, S10, S12, S13, S14 and S15). These are aimed at covering some disciplines of Artificial Intelligence which are not studied in the modules.

- Seminars by visiting professors, in which the student acquires advanced or specialised knowledge about any of the subjects taught within the course.

Note: seminars can be attended as distance learning via videoconferencing. (S9: Fuzzy logic and S12: Principals of Robotic Locomotion cannot be attended by videoconference).

SEMINAR DESCRIPTIONS

S1: Research Methodology (offered in English). This seminar guides students about the most common methods, techniques and systems used for the practice of scientific research, what will be relevant for the development of their MSc theses, as well as for some of the courses covered in this Master. The topics that will be covered in this seminar are the following:

- The career of a researcher, where the different paths and stages of the career of a researcher in academia or industry will be reviewed and discussed.
- The Scientific Method and how it can be applied in the context of Artificial Intelligence.
- The role of scientific publications in research, including where and when to publish results, and how to publish them.
- Methods and Techniques for generating a literature review.
- Intellectual property, including industrial property, copyright and software licenses.

- Open Science: principles, good practices and trends.

S2: Project Management and Risk Control (offered in English). This seminar will cover fundamental aspects of project management and risk control. It will be possible for the student to understand the principles of project management, risk and change management, as well as to acquire the ability to apply methodologies and processes for project management and risk mitigation.

S3: Ethical and legal aspects of Artificial Intelligence (offered in English). This seminar provides students with some notions on AI regulation, data governance, intellectual property, privacy and data protection, which are necessary to manage AI projects. The students will also learn how to evaluate in practice the ethical impact of an AI project.

S4: Artificial Intelligence and Inclusion (offered in English). This seminar will provide the student with general knowledge about Bias and Fairness in AI methods and techniques with respect to the disability dimension, since most of the research done so far on these aspects has focused on race and gender; Explicability, in general and with respect to the disability dimension (an essential aspect to minimize bias and ensure fairness refers to the creation of explanations associated with AI developments); and Cases of use and applications of AI methods and techniques to solve social inclusion problems.

S5: Decision Analysis (offered in English). The seminar provides students with a general knowledge on the topic of Decision Analysis, being itself an introduction to the different modules that are part of the subject: Decision Support Systems, Participatory Decision-Making and Negotiation and Simulation Methods.

S6: Machine Learning (offered in English). The seminar provides students with general knowledge about the topic of Machine Learning, being itself an introduction to the various modules and seminars that are part of the subject: Bayesian Networks, Machine Learning and Neural Networks.

S6: Natural Computing (offered in english). The seminar provides students with general knowledge about the topic of Natural Computing, being itself an introduction to the different modules which are part of the subject: Intelligent Search based on Metaheuristics, Evolutionary Computation and Unconventional Computing (biomolecular computing and biocircuit engineering).

S8: Knowledge Representation and Reasoning (offered in English). The seminar provides students with general knowledge on the topic of Knowledge Representation and Reasoning Models, being itself an introduction to the several modules and seminars that are part of the subject: Intelligent Agents and Multi- agent Systems, Ontology Engineering, Commonsense Reasoning and Fuzzy Logics.

S9: Fuzzy Logic (offered in Spanish). This seminar aims to provide the theoretical and practical foundations of Fuzzy Logic, which permits to represent imprecise knowledge. Students will acquire knowledge of the design of fuzzy control systems and their inference process in current applications and real-world scenarios. This seminar is intended for students without previous experience in fuzzy logic.

S10: Cognitive Computing (offered in Spanish)**.** The aim of this seminar is to provide an introduction to Cognitive Science and Cognitive Systems, paying attention to architectures, key components, and revising the main systems and platforms that can be found in the literature.

S11: Cognitive Robotics and Perception (all the documentation is offered in English but lectures are given in a mixture of Spanish and English to guarantee the best communicative results). The seminar provides students with general knowledge on the topic of Robotics and Computational Perception, being itself an introduction to the several modules and seminars that are part of the subject: Computer Vision, Autonomous Robots and Evolutionary Robotics.

S12: Principals of Robotic Locomotion (offered in English). Very few living organisms do not have the capacity of locomotion, being able to move is fundamental to survival in the real world. Likewise, locomotion is one of the basic capacities expected of an intelligent robotic system. In this seminar we will discuss issues related to robot locomotion with a focus on navigation and mapping. Participants in the seminar will build a simple robot controller and will test that controller in a real robot.

S13: Applications of Artificial Intelligence (offered in English). The seminar is a compendium of Artificial Intelligence applications naturally taking full advantage of the research potential of professors at DIA and the experience of its members in numerous R&D projects undertaken in recent years. In order to do this, descriptions of all DIA modules (and particularly those who have an applied component and less than basic research) are considered and included in this seminar. In this seminar not only are the topics important to teach, but teaching the very development of Artificial Intelligence applications and projects in the area, exceeding the idea of mere exposition of a theoretical lectures without the applied aspect which is essential in Artificial Intelligence and particularly for industrial use.

S14: Language Engineering (offered in Spanish). The purpose of this seminar derives from the need to fill a gap in the teaching of subjects that are, generally speaking, on Language Engineering. On the one hand, when we talk about Engineering, then we talk about design, methodologies, techniques, systems, and components; on the other hand, when we talk about language then we talk about grammars, corpora, dictionaries, etc. Usually, the teaching of these subjects often has a tendency, perhaps excessive, to one side or another. This seminar aims to provide a unified view of both sides, from the fundamentals to applications. The area of Linguistic Engineering is considered to be one of the areas where most research and development efforts will lie in the next few years, if we are to achieve the goal of having machines that really make our lives easier in a simple way. The seminar is focused, in

the first part, on the state of the art technologies, followed by a second part where we will explore in depth technologies that allow supporting applications on the market. For practical reasons, the practice work will be focused in word processing technologies.

S15: Automated Planning (offered in English). Automated planning is a branch of Artificial intelligence aimed at obtaining plans (i.e. sequences of actions) for solving complex problems or for governing the behavior of intelligent agents, autonomous robots or unmanned vehicles. Planning techniques have been successfully applied in different domains, including industrial contexts, logistics, computer games, robotics or space exploration. In this seminar we will review the existing approaches for solving classical planning problems, such as state-space search, plan-space search, graph-based techniques or turning classical planning problems into propositional satisfiability problems. The course will then focus on the study of knowledge-based planning methods, such as control rule-based pruning or hierarchical task network-based planning techniques. These approaches exploit the domain knowledge provided by human experts to improve the performance of the planning algorithms. Finally, we will briefly introduce advanced planning algorithms, which are able to generate planning policies that take into account time constraints and/or partial observability conditions, which are common in real world applications.

4.2. Syllabus

1. S1: Research methodology
2. S2: Project management and risk control
3. S3. Ethical and legal aspects of Artificial Intelligence
4. S4. Artificial Intelligence and Inclusion
5. S5: Decision analysis
6. S6: Machine learning
7. S7: Natural computing
8. S8: Knowledge representation and reasoning
9. S9: Fuzzy logic
10. S10: Cognitive computing
11. S11: Cognitive robotics and perception
12. S12: Principals of robotic locomotion

13. S13: Applications of Artificial Intelligence
14. S14: Natural language processing
15. S15: Automated planning
16. S16-18: Seminars by visiting professors

5. Schedule

5.1. Subject schedule*

Week	Face-to-face classroom activities	Face-to-face laboratory activities	Distant / On-line	Assessment activities
1	**S1: Research methodology** Duration: 10:00 Lecture			**Evaluation of seminar S1. Research methodology** Individual work Continuous assessment and final examination Not Presential Duration: 00:00 **Evaluation of seminar S1. Research methodology. Test** Written test Continuous assessment and final examination Not Presential Duration: 01:00
2	**S2: Project management and risk control** Duration: 10:00 Lecture			**Evaluation of Seminar 2. Project management and risk control** Individual work Continuous assessment and final examination Not Presential Duration: 00:00
3	**S3: Ethical and legal aspects of Artificial Intelligence** Duration: 10:00 Lecture			**Evaluation of seminar S3. Ethical and legal aspects of Artificial Intelligence** Individual work Continuous assessment and final examination Not Presential Duration: 00:00
4	**S4: Artificial Intelligence and Inclusion** Duration: 10:00 Lecture			**Evaluation of seminar S4. Artificial Intelligence and Inclusion** Individual work Continuous assessment and final examination Not Presential Duration: 00:00
5	**S5: Decision analysis** Duration: 10:00 Lecture			**Evaluation of seminar S5. Decision analysis** Individual work Continuous assessment and final examination Not Presential Duration: 00:00

6	**S6: Machine learning** Duration: 10:00 Lecture			**Evaluation of seminar S6. Machine learning** Individual work Continuous assessment and final examination Presential Duration: 00:00
7	**S7: Natural computing** Duration: 10:00 Lecture			**Evaluation of seminar S7. Natural computing** Individual work Continuous assessment and final examination Not Presential Duration: 00:00
8	**S8: Knowledge representation and reasoning** Duration: 10:00 Lecture			**Evaluation of seminar S8. Knowledge representation and reasoning** Individual work Continuous assessment and final examination Not Presential Duration: 00:00
9	**S9: Fuzzy logic** Duration: 08:00 Lecture			**Evaluation of seminar S9. Fuzzy Logic** Written test Continuous assessment and final examination Presential Duration: 02:00
10	**S10: Cognitive Computing** Duration: 10:00 Lecture			**Evaluation of seminar S10. Cognitive computing** Individual work Continuous assessment and final examination Not Presential Duration: 00:00
11	**S11: Cognitive robotics and perception** Duration: 10:00 Lecture			**Evaluation of seminar S11. Cognitive robotics and perception** Individual work Continuous assessment and final examination Not Presential Duration: 00:00
12	**S12: Principals of robotic locomotion** Duration: 10:00 Lecture			**Evaluation of seminar S12. Principals of robotic locomotion** Individual work Continuous assessment and final examination Presential Duration: 00:00
13	**S13: Applications of Artificial Intelligence** Duration: 10:00 Lecture			**Evaluation of seminar S13. Applications of Artificial Intelligence** Individual work Continuous assessment and final examination Not Presential Duration: 00:00

14	**S14: Natural language processing** Duration: 10:00 Lecture			**Evaluation of seminar S14. Natural language processing** Individual work Continuous assessment and final examination Not Presential Duration: 00:00
15	**S15: Automated planning** Duration: 10:00 Lecture			**Evaluation of seminar S15. Automated planning** Individual work Continuous assessment and final examination Not Presential Duration: 00:00
16	**S16: Seminar by visiting professor** Duration: 10:00 Lecture **S17: Seminar by visiting professor** Duration: 10:00 Lecture **S18: Seminar by visiting professor** Duration: 10:00 Lecture			
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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
1	Evaluation of seminar S1. Research methodology	Individual work	No Presential	00:00	11.66%	/ 10	CGI3 CGI4 CB10 CB9
1	Evaluation of seminar S1. Research methodology. Test	Written test	No Presential	01:00	5%	/ 10	CB10
2	Evaluation of Seminar 2. Project management and risk control	Individual work	No Presential	00:00	16.66%	/ 10	CGI3 CGI4
3	Evaluation of seminar S3. Ethical and legal aspects of Artificial Intelligence	Individual work	No Presential	00:00	16.66%	/ 10	CG11 CGI3 CGI5 CB9
4	Evaluation of seminar S4. Artificial Intelligence and Inclusion	Individual work	No Presential	00:00	16.66%	/ 10	CB9 CG11 CGI3
5	Evaluation of seminar S5. Decision analysis	Individual work	No Presential	00:00	16.66%	/ 10	CGI3 CGI4
6	Evaluation of seminar S6. Machine learning	Individual work	Face-to-face	00:00	16.66%	/ 10	CB10 CGI3 CB7
7	Evaluation of seminar S7. Natural computing	Individual work	No Presential	00:00	16.66%	/ 10	CGI3 CGI4 CB7 CB10
8	Evaluation of seminar S8. Knowledge representation and reasoning	Individual work	No Presential	00:00	16.66%	/ 10	CB10
9	Evaluation of seminar S9. Fuzzy Logic	Written test	Face-to-face	02:00	16.66%	/ 10	CB7 CB10 CGI4
10	Evaluation of seminar S10. Cognitive computing	Individual work	No Presential	00:00	16.66%	/ 10	CGI4 CB10

11	Evaluation of seminar S11. Cognitive robotics and perception	Individual work	No Presential	00:00	16.66%	/ 10	CGI3 CB10
12	Evaluation of seminar S12. Principals of robotic locomotion	Individual work	Face-to-face	00:00	16.66%	/ 10	CGI4 CB7 CB10 CB9 CGI1 CGI3
13	Evaluation of seminar S13. Applications of Artificial Intelligence	Individual work	No Presential	00:00	16.66%	/ 10	CGI4 CB7 CGI1 CGI3
14	Evaluation of seminar S14. Natural language processing	Individual work	No Presential	00:00	16.66%	/ 10	CGI1 CGI3 CGI4 CB7
15	Evaluation of seminar S15. Automated planning	Individual work	No Presential	00:00	16.66%	/ 10	CGI3 CGI4 CB7 CGI1

6.1.2. Final examination

Week	Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
1	Evaluation of seminar S1. Research methodology	Individual work	No Presential	00:00	11.66%	/ 10	CGI3 CGI4 CB10 CB9
1	Evaluation of seminar S1. Research methodology. Test	Written test	No Presential	01:00	5%	/ 10	CB10
2	Evaluation of Seminar 2. Project management and risk control	Individual work	No Presential	00:00	16.66%	/ 10	CGI3 CGI4
3	Evaluation of seminar S3. Ethical and legal aspects of Artificial Intelligence	Individual work	No Presential	00:00	16.66%	/ 10	CG11 CGI3 CGI5 CB9
4	Evaluation of seminar S4. Artificial Intelligence and Inclusion	Individual work	No Presential	00:00	16.66%	/ 10	CB9 CG11 CGI3
5	Evaluation of seminar S5. Decision analysis	Individual work	No Presential	00:00	16.66%	/ 10	CGI3 CGI4
6	Evaluation of seminar S6. Machine learning	Individual work	Face-to-face	00:00	16.66%	/ 10	CB10 CGI3 CB7
7	Evaluation of seminar S7. Natural computing	Individual work	No Presential	00:00	16.66%	/ 10	CGI3 CGI4 CB7 CB10

8	Evaluation of seminar S8. Knowledge representation and reasoning	Individual work	No Presential	00:00	16.66%	/ 10	CB10
9	Evaluation of seminar S9. Fuzzy Logic	Written test	Face-to-face	02:00	16.66%	/ 10	CB7 CB10 CGI4
10	Evaluation of seminar S10. Cognitive computing	Individual work	No Presential	00:00	16.66%	/ 10	CGI4 CB10
11	Evaluation of seminar S11. Cognitive robotics and perception	Individual work	No Presential	00:00	16.66%	/ 10	CGI3 CB10
12	Evaluation of seminar S12. Principals of robotic locomotion	Individual work	Face-to-face	00:00	16.66%	/ 10	CGI4 CB7 CB10 CB9 CGI1 CGI3
13	Evaluation of seminar S13. Applications of Artificial Intelligence	Individual work	No Presential	00:00	16.66%	/ 10	CGI4 CB7 CGI1 CGI3
14	Evaluation of seminar S14. Natural language processing	Individual work	No Presential	00:00	16.66%	/ 10	CGI1 CGI3 CGI4 CB7
15	Evaluation of seminar S15. Automated planning	Individual work	No Presential	00:00	16.66%	/ 10	CGI3 CGI4 CB7 CGI1

6.1.3. Referred (re-sit) examination

No se ha definido la evaluación extraordinaria.

6.2. Assessment criteria

The grade of the subject is the average of the marks obtained in each of the 5 seminars taken. The evaluation activities in each one of them vary, being those indicated below:

- **S1: Research methodology:** Although the seminar is compulsory, attendance is not mandatory. The student will individually do a test and perform a work:
  - Test related to the contents of the seminar, done at the end of the seminar (30% of the grade)
  - Summarizing the most important points addressed in the seminar (70% of the grade)
- **S2: Project management and risk analysis:** The final grade is obtained as follows:
  - Grade of written summary of the most important points presented at the seminar (30%)
  - Grade of written summary and presentation of one of the topics presented in class (30%)
  - Grade of attendance and participation in class (40%). The student must attend at least the 80% of the classes
- **S3: Ethical and legal aspects of Artificial Intelligence**: The final grade is obtained as follows:
  - Students will have to deliver an individual report around a topic of choice where all the skills acquired in this course are demonstrated.
  - Attendance and participation during the sessions will also evaluated.
- **S4: Artificial Intelligence and Inclusion:**
  - Students will have to deliver an individual report around a topic of choice where all the skills acquired in this course are demonstrated and an oral presentation.
  - Attendance and participation during the sessions will also evaluated.
- **S5: Decision Analysis:**
  - Regular attendance to class will be an essential condition.
  - Individual summary about the theoretical content of the course. It will be evaluated according to its completeness, clarity and coherence.
  - Collective work on the state of the art of the discipline through a specific wiki associated to the seminar. It will be evaluated according to the participation index, the ability to interconnect ideas, clarity and originality.
- **S6: Machine Learning:** Attendance will be mandatory. The student will individually perform a practical work consisting of software management and oral presentation of an application case.

- **S7: Natural computing**:
  - Compulsory attendance at the seminars = 35% of the final grade.
  - Individual work summary report = 65% of the final grade.
- **S8: Knowledge representation and reasoning**: The final grade will be computed in the following way:
  - Attendance to class (attendance is mandatory at a minimum of 80%). Weight in the final grade of 40%.

- Summary of the most important points discussed in the seminar. The clarity, coherence and correct use of the terminology will be evaluated. Weight in the final grade of 30%.
- Individual work that delves into one of the topics covered in the seminar. The presentation, clarity and adequacy of the bibliographic references used will be evaluated. Weight in the final grade of 30%.

- **S9: Fuzzy logic:**
  - Attendance to the classes, with a weighting of 40% on the final grade.
  - There will be a written exam on the last day of the seminar, without the possibility of consulting notes, bibliography or any other type of documentation. The qualification of this exam will have a weight of 60% on the final grade.
- **S10: Cognitive computing**.
  - Attendance to class (a minimum of 80% attendance is mandatory). Weight in the final grade of 40%.
  - Summary of the most important points discussed in the seminar. The clarity, coherence and correct use of the terminology will be evaluated. Weight in the final grade of 30%.
  - Individual work that delves into one of the topics covered in the seminar. The presentation, clarity and adequacy of the bibliography will be evaluated. Weight in the final grade of 30%.
- **S11: Cognitive robotics and perception:** The evaluation is done through a work that can be exposed in the classes. They can be bibliographic works or of application of some of the methods and techniques studied. Attendance and participation in face-to-face classes and other activities that are proposed during the seminars are also valued.
- **S12: Principals of robotic locomotion:** 25% of the evaluation will be computed based on the attendance and participation in classes during the seminar and 75% in a practical project.
- **S13: Application of Artificial Intelligence:** The attendance of the students to the seminar will be valued, on the one hand, and the development of a practical work on one of the topics of the seminar. The workload necessary for this practice will be adequate and proportional to the idea of a seminar and the number of credits.
- **S14: Natural Language processing:** The seminar will be based on attendance in at least 80% of the classes as well as a work done individually or in a group on a topic to be defined related to the exploration of information on some type of system in the market, its analysis and conclusions. It is not intended with this work more than to accustom the student to search existing solutions in the market and learn to develop an idea of how to solve them. The qualification in the July session will be governed by the same rules as in June. Attendance 80% of the classes is required as well as to delivery an individual or group work. The work will be qualified.
- **S15: Automated planning:** Half of the grade will come from the attendance to the classes and short practices carried out during the seminar, and the other half will be computed based on a project that will be carried out by the students.
- **S16-18: Seminar by visiting professors:** The evaluation activities of this seminar will be established by the invited professor in the corresponding academic course.

7. Teaching resources

7.1. Teaching resources for the subject

Name	Type	Notes
Videoconference system	Equipment	Videoconference system based on Zoom, Blackboard Collaborate or Microsoft Teams
Moodle	Web resource	Course available at UPM moodle including timetabling, documentation... https://moodle.upm.es/titulaciones/oficiales/course/view.php?id=6732
K. Belhajjame, J. Zhao, D. Garijo, M. Gamble, K. Hettne, R. Palma, E. Mina, O. Corcho et al. (2015) Using a suite of ontologies for preserving workflow-centric research objects. Web Semantics: Science, Services and Agents on the World Wide Web 3,16-42	Bibliography	Seminar S1. Research methodology
Kitchenham, B.; Charters, S. Guidelines for Performing Systematic Literature Reviews in Software Engineering; Technical Report EBSE; School of Computer Science and Mathematics, Keele University: Keele, UK, 2007	Bibliography	Seminar S1. Research Methodology
Wilkinson, M., Dumontier, M., Aalbersberg, I. et al. The FAIR Guiding Principles for scientific data management and stewardship. Sci Data 3, 160018 (2016). https://doi.org/10.1038/sdata.2016.18	Bibliography	Seminar S1. Research Methodology

A Guide to the Project Management Body of Knowledge (Pmbok(r) Guide). Project Mgmt Inst; Edición: Sixth Edition. 2017.	Bibliography	Seminar S2. Project management and risk control
A guide to the Project Management Body of Knowledge (PMBOK guide) & Agile practice guide bundle. Project Mgmt Inst. 2017	Bibliography	Seminar S2. Project management and risk control
Project Risk Management: Processes, Techniques and Insights, 2nd Edition. Chris Chapman, Stephen Ward. 2013.	Bibliography	Seminar S2. Project management and risk control
Quinn, M. J. (2017). Ethics for the information age. Pearson.	Bibliography	Seminar S3. Ethical and legal aspects of Artificial Intelligence
Anhong Guo, Ece Kamar, Jennifer Wortman Vaughan, Hanna Wallach, Meredith Ringel Morris (2019). Toward Fairness in AI for People with Disabilities: A Research Roadmap.	Bibliography	Seminar S4. Artificial Intelligence and Inclusion
Clayton Lewis (2018). Implications of Developments in Machine Learning for People with Cognitive Disabilities.	Bibliography	Seminar S4. Artificial Intelligence and Inclusion
Meredith Whittaker; Cynthia L. Bennett; Sara Hendren; Liz Kaziunas; Mara Mills; Meredith Ringel Morris; Joy Rankin; Emily Rogers; Marcel Salas; Sarah Myers West (2019) Disability, Bias, and AI.	Bibliography	Seminar S4. Artificial Intelligence and Inclusion
Clemen, R.T. (1996) Making Hard Decisions, Duxbury Press	Bibliography	Seminar S5. Decision analysis
French, S., Maule, J., Papamichail, N. (2009) Decision Behavior, Analysis and Support, Cambridge University Press	Bibliography	Seminar S5. Decision analysis

Hwang, C-H.; Lin, M-J. (1987). Group decision making under multiple criteria. Springer-Verlag, Berlín	Bibliography	Seminar S5. Decision analysis
Law, A. M. (2007) Simulation Modeling and Analysis, McGraw-Hill, New York.	Bibliography	Seminar S5. Decision analysis
Raiffa, H.; Richardson, J.; Metcalfe, D. (2002). Negotiation Analysis. Belknap Harvard, Cambridge, MA.	Bibliography	Seminar S5. Decision analysis
Ríos Insua, S., Bielza, C., Mateos, A. (2002). Fundamentos de los Sistemas de Ayuda a la Decisión. RA-MA, Madrid.	Bibliography	Seminar S5. Decision analysis
Ríos Insua, D., Ríos Insua, S., Martín, J., Jiménez, A. (2008). Simulación: Métodos y Aplicaciones. RA-MA, Madrid.	Bibliography	Seminar S5. Decision analysis
Romero, C. (1991). Handbook of Critical Issues in Goal Programming. Pergamon Press	Bibliography	Seminar S5. Decision analysis
Koller, D, Friedman, N. (2009) Probabilistic Graphical Models. Principles and Techniques. The MIT Press.	Bibliography	Seminar S6. Machine learning
C. Bielza, P. Larrañaga (2020). Data Driven Computational Neuroscience. Machine Learning and Statistical Models. Cambridge University Press	Bibliography	Seminar S6. Machine Learning
Castillo, E., Gutiérrez, J.M., Hadi, A.S. (1997) Expert Systems and Probabilistic Network Models. Springer, New York. Versión en español, disponible en la red: Sistemas Expertos y Modelos de Redes Probabilísticas, Academia de Ingeniería, Madrid	Bibliography	Seminar S6. Machine learning

Koski, T., Noble, J. (2009) Bayesian Networks: An Introduction, Wiley	Bibliography	Seminar S6. Machine learning
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Pourret, O., Naïm, P., Marcot, B. (2008) Bayesian Networks: A Practical Guide to Applications, Wiley	Bibliography	Seminar S6. Machine learning
Alpaydin, E. (2004) Introduction to Machine Learning. MIT Press	Bibliography	Seminar S6. Machine learning
Duda, R., Hart, P.E., Stork, D.G. (2001) Pattern Classification. Wiley	Bibliography	Seminar S6. Machine learning
I. Goodfellow, Y. Bengio, A. Courville (2016): Deep Learning. MIT Press. Available online: http://www.deeplearningbook.org	Bibliography	Seminar S6. Machine learning
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P. Larrañaga, D. Atienza, J. Diaz-Rozo, A. Ogbechie, C. Puerto-Santana, C. Bielza (2019). Industrial Applications of Machine Learning. CRC Press.	Bibliography	Seminar S6. Machine learning
Kuncheva, L. (2004) Combining Pattern Classifiers. Wiley	Bibliography	Seminar S6. Machine learning
Webb, A. (2002) Statistical Pattern Recognition. Wiley	Bibliography	Seminar S6. Machine learning
Witten, I., Frank, E. (2005) Data Mining. Morgan Kaufmann. 2ª ed	Bibliography	Seminar S6. Machine learning
Armañanzas, R.; Inza, I.; Santana, R., Saeys, Y.; Flores, J.L.; Lozano, J.A., Larrañaga, P. (2008) A review of estimation of distribution algorithms in bioinformatics. BioData Mining 1 (1), 1-12	Bibliography	Seminar S7. Natural Computing

Deb, K. (2001), Multi-Objective Optimization using Evolutionary Algorithms. Wiley	Bibliography	Seminar S7. Natural Computing
Inza, I.; Larrañaga, P.; Etxeberria, R.; Sierra, B. (2000) Feature subset selection by Bayesian network-based optimization. Artificial intelligence 123 (1-2), 157-184	Bibliography	Seminar S7. Natural Computing
Larrañaga, P.; Karshenas, H.; Bielza, C.; Santana, C. (2013) A review on evolutionary algorithms in Bayesian network learning and inference tasks. Information Sciences 233, 109-125	Bibliography	Seminar S7. Natural Computing
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Larrañaga, P.; Lozano, J.A. (2001) Estimation of distribution algorithms: A new tool for evolutionary computation. Springer Science & Business Media	Bibliography	Seminar S7. Natural Computing
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Urrutia-Zambrana, A., Tirado, G., Mateos, A. (2020), Variable Neighborhood Search to Solve the Generalized Orienteering Problem, International Transactions in Operational Research.	Bibliography	Seminar S7. Natural Computing
https://www.youtube.com/watch?v=jp7IF8uOxyE	Web resource	Seminar S7. Natural Computing
Mueller, E. (2006) Commonsense Reasoning. Morgan Kaufmann	Bibliography	Seminar S8. Knowledge representation and reasoning
Wooldridge, M. (2009) An Introduction to Multiagent Systems. 2nd edition, John Wiley and Son	Bibliography	Seminar S8. Knowledge representation and reasoning
Gomez-Pérez, A., Fernández, M., Corcho, O. (2003) Ontological Engineering. Springer	Bibliography	Seminar S8. Knowledge representation and reasoning
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Molina, M., Blasco, G. (2003) A Multi-agent system for Emergency Decision Support. 4th International Conference of Intelligent Data Engineering and Automated Learning (IDEAL 2003) In "Intelligent Data Engineering and Automated Learning" LNCS, 2690	Bibliography	Seminar S13. Applications of Artificial Intelligence
Murphy, R. (2000) Introduction to AI Robotics, MIT.	Bibliography	Seminar S12. Principals of robotic locomotion
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Ghallab, M., Nau, D., Traverso, P. (2004) Automated Task Planning. Theory & Practice. Morgan Kaufmann	Bibliography	Seminar S15. Automated planning

Allen, J.F., Hendler, J., Tate, A. (eds.) (1990) Readings in planning. Morgan Kaufmann	Bibliography	Seminar S15. Automated planning
Russell, S., Norvig, P. (1996) Inteligencia Artificial. Un enfoque moderno. Prentice Hall	Bibliography	Seminar S15. Automated planning

8. Other information

8.1. Other information about the subject

Although the Seminars subject is taught in the second semester, seminar S1: Research Methodology is also taught (exceptionally) in the first week of the first semester. Students can choose to attend this seminar in any of the two semesters.

Seminars can be attended as distance learning via videoconferencing. (S9: Fuzzy logic and S12: Principals of Robotic Locomotion cannot be attended by videoconference).

Teaching staff:

S1: Research methodology

Óscar Corcho García, Asunción Gómez Pérez (coordinator)

S2: Project management and risk control

Javier Bajo Pérez (coordinator), Asunción Gómez Pérez

S3: Ethical and legal aspects of Artificial Intelligence

Asunción Gómez Pérez (coordinator), Víctor Rodríguez Doncel

S4: Artificial Intelligence and Inclusion

Javier Bajo Pérez, María del Carmen Suárez de Figueroa (coordinator), Emilio Serrano Fernández

S5: Decision analysis

Concha Bielza Lozoya, Jacinto González Pachón (coordinator), Antonio Jiménez Martín

S6: Machine learning

Concha Bielza Lozoya, Pedro Larrañaga Múgica (coordinator), Martín Molina González

S7: Natural Computing

Alfonso Rodríguez Patón (coordinator), Pedro Larrañaga Múgica, Alfonso Mateos Caballero

S8: Knowledge representation and reasoning

Javier Bajo Pérez (coordinator), Óscar Corcho García, Asunción Gómez Pérez, Manuel Hermenegildo Salinas, Pepa Hernández Diego, Martín Molina González, Elena Montiel Ponsoda, Mª del Carmen Suárez de Figueroa, Nik Swoboda

S9: Fuzzy logic

Daniel Manrique Gamo (coordinator)

S10: Cognitive computing

Javier Bajo Pérez (coordinator), Óscar Corcho García, Asunción Gómez Pérez, Jacinto González Pachón, Pepa Hernández Diego

S11: Cognitive robotics and perception

Luis Baumela Molina, Javier de Lope Asiaín, Darío Maravall Gómez-Allende (coordinator), Nik Swoboda

S12: Principals of robotic locomotion

Nik Swoboda (coordinator)

S13: Applications of Artificial Intelligence

Jesús Cardeñosa Lera, Juan Antonio Fernández del Pozo, Asunción Gómez Pérez, Víctor Maojo García (coordinator), Antonio Jiménez Martín, Alfonso Mateos Caballero, Martín Molina González, Elena Montiel Ponsoda, David Pérez del Rey, Mª del Carmen Suárez de Figureoa Baonza

S14: Natural language processing

Igor Boguslavski, Jesús Cardeñosa Lera (coordinator)

S15: Automated planning

Miguel García Remesal (coordinator)

S16-18: Seminar by visiting professors

Although the Seminars subject is taught in the second semester, seminar S1: Research Methodology is also taught (exceptionally) in the first week of the first semester. Students can choose to attend this seminar in any of the two semesters.

ODS:

In the Project Management and Risk Management seminar, all SDGs are addressed, as European calls for projects are explained and all of them assess the SDGs.

The Artificial Intelligence and Inclusion seminar covers: SDG4 (Quality Education), SDG5 (Gender Equality), and

SDG10 (Reducing Inequalities).

The Automatic Planning seminar works on SDG 7: Affordable Energy. It explains how automated planning techniques can optimise the movement of containers in port terminals, thus contributing to a more efficient use of the energy resources required by cranes and other container transport and exchange vehicles.

The seminars Knowledge Representation and Reasoning and Cognitive Computing address SDG10: Reducing inequalities.