ANX-PR/CL/001-01

LEARNING GUIDE

SUBJECT

103000739 - Adaptive Systems

DEGREE PROGRAMME

10AM - Master Universitario En Ingenieria Del Software

ACADEMIC YEAR & SEMESTER

2022/23 - Semester 1

Index

Learning guide

1. Description

1.1. Subject details

Name of the subject	103000739 - Adaptive Systems
No of credits	4 ECTS
Type	Optional
Academic year ot the programme	First year
Semester of tuition	Semester 1
Tuition period	September-January
Tuition languages	English
Degree programme	10AM - Master Universitario en Ingenieria del Software
Centre	10 - Escuela Tecnica Superior De Ingenieros Informaticos
Academic year	2022-23

2. Faculty

2.1. Faculty members with subject teaching role

Name and surname	Office/Room	Email	Tutoring hours *
Angelica De Antonio Jimenez	5108	angelica.deantonio@upm.es	Sin horario. The tutoring table can be found at: https://docs.google.com/spreadsheets/d/1Zi99dtPBXiFFJg4HUSAUelj2M0QijPUeTSmv1FTeNOY/edit#gid=0

Jaime Ramirez Rodriguez (Subject coordinator)	5112	jaime.ramirez@upm.es	Sin horario. The tutoring table can be found at: https://docs.google.com/spreadsheets/d/1Zi99dtPBXiFFJg4HUSAUelj2M0QijPUeTSmv1FTeNOY/edit#gid=0

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

3. Prior knowledge recommended to take the subject

3.1. Recommended (passed) subjects

The subject - recommended (passed), are not defined.

3.2. Other recommended learning outcomes

- Computer programming

4. Skills and learning outcomes *

4.1. Skills to be learned

CE13 - Tener una visión de los distintos aspectos específicos y emergentes de la ingeniería del software, y profundizar en algunos de ellos

CE14 - Comprender lo que pueden y no pueden conseguir las prácticas actuales de ingeniería del software, y sus limitaciones y su posible futura evolución.

CG13 - Apreciación de los límites del conocimiento actual y de la aplicación práctica de la tecnología más reciente

CG18 - Capacidad de trabajar y comunicarse también en contextos internacionales

CG3 - 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 (RD)

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

4.2. Learning outcomes

RA88 - Knowledge of Methods for student modelling and individualized and adapted interaction with learning systems

RA89 - Model the user and to design adaptive user interfaces based on the user

* 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.

5. Brief description of the subject and syllabus

5.1. Brief description of the subject

Interaction design methods focused on providing the same content to all users offer limited possibilities in addressing the specific needs and requirements of different types of users. Therefore, an essential feature of certain interactive applications should be their ability to provide some form of automatic adaptation and customization. The main objective of this course is to achieve an understanding of the models, techniques and architectures necessary to make a computer application dynamically adapt to the specific needs and requirements of different types of users at all times.

Adaptive systems maintain a model of the interests, preferences and / or knowledge of each individual user, and use this model to adapt the behavior of the systems to the needs of that user.

This course will cover the main components of the user model in the context of adaptive systems. And within the adaptive systems, the personalized search systems on the Web will be addressed first and it will be explained how these systems are supported by the user model.

Recommendation systems have become essential tools in many areas of application, because they help alleviate information overload as they select the most appropriate content for each user based on their preferences and / or interests. In this sense, these types of systems help users in decision-making by providing personalized services

and help information providers and companies to serve customers more effectively.

In this course, the general characteristics of the recommendation systems will be explained and a classification of these systems will be presented according to the type of techniques they use to generate the recommendations. According to this classification, we will distinguish between content-based, collaborative filtering, and hybrid recommenders. Following this, an introduction will be given to the main techniques on which each of these groups of recommenders are based, highlighting the strengths and weaknesses of each group.

By designing and testing improved forms of interactive collaboration between humans and digital assistants, we can enable decision-making processes that better leverage the strengths of both partners. To make the interaction between them more fruitful, we can resort to dialogue systems based on natural language processing techniques.

Therefore, one of the topics of the course will be devoted to dialogue systems taking as a case study the cognitive service of IBM, Watson Assistant. Likewise, the problem of designing dialogue systems that are truly adaptive to the user and not mere natural language interfaces for a database will be addressed.

E-learning is a traditional domain for the application of personalization and adaptation technologies. One of the main objectives of these applications is to improve the effectiveness and efficiency of learning experiences. The last topic of the course will be about adaptive e-learning systems paying special attention to intelligent tutoring systems.

5.2. Syllabus

1. User Modeling for Adaptive Systems and Adaptive Web
2. Recommender Systems
3. Dialog Systems
4. Technology-enhanced adaptive learning

6. Schedule

6.1. Subject schedule*

Week	Classroom activities	Laboratory activities	Distant / On-line	Assessment activities
1	**Presentation of the subject** Duration: 02:00 Lecture			
2	**User modeling for Adaptive Systems and Adaptive Web** Duration: 02:00 Lecture			
3	**Recommender Systems** Duration: 02:00 Lecture			
4	**Recommender Systems** Duration: 02:00 Lecture			
5	**Recommender Systems** Duration: 02:00 Lecture			**Exam** Online test Continuous assessment and final examination Not Presential Duration: 01:00
6	**Workshop associated with practical exercise 1** Duration: 02:00 Laboratory assignments			**Practical exercise 1** Group work Continuous assessment and final examination Not Presential Duration: 07:00
7	**Recommender Systems** Duration: 02:00 Lecture			**Practical exercise 1** Group work Continuous assessment and final examination Not Presential Duration: 07:00
8	**Recommender Systems** Duration: 02:00 Lecture			**Practical exercise 1** Group work Continuous assessment and final examination Not Presential Duration: 20:00
9	**Workshop associated with practical exercise 2** Duration: 02:00 Laboratory assignments			**Practical exercise 2** Group work Continuous assessment and final examination Not Presential Duration: 20:00

10	**Recommender Systems** Duration: 02:00 Lecture			**Practical exercise 2** Group work Continuous assessment and final examination Not Presential Duration: 10:00
11	**Dialog Systems** Duration: 02:00 Lecture			**Practical exercise 2** Group work Continuous assessment and final examination Not Presential Duration: 10:00
12	**Technology-enhanced adaptive learning** Duration: 02:00 Lecture			
13	**Technology-enhanced adaptive learning** Duration: 02:00 Lecture			
14	**Technology-enhanced adaptive learning** Duration: 02:00 Lecture			
15	**Research topic presentations** Duration: 02:00 Additional activities			**Research topic analysis** Group work Continuous assessment Presential Duration: 08:00 **Design of Adaptive Tutoring System** Group work Continuous assessment Presential Duration: 00:00
16				
17				

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.

7. Activities and assessment criteria

7.1. Assessment activities

7.1.1. Assessment

Week	Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
5	Exam	Online test	No Presential	01:00	10%	0 / 10	CG13 CE14 CE13
6	Practical exercise 1	Group work	No Presential	07:00	5%	5 / 10	CG13 CE14 CG3 CE13
7	Practical exercise 1	Group work	No Presential	07:00	5%	5 / 10	CG13 CE14 CG3 CE13
8	Practical exercise 1	Group work	No Presential	20:00	15%	5 / 10	CG13 CE14 CG3 CE13
9	Practical exercise 2	Group work	No Presential	20:00	20%	5 / 10	CG9 CG13 CE14 CG8 CG18 CE13
10	Practical exercise 2	Group work	No Presential	10:00	10%	5 / 10	CG9 CG13 CE14 CG8 CG18 CE13
11	Practical exercise 2	Group work	No Presential	10:00	10%	5 / 10	CG9 CG13 CE14 CG8 CG18 CE13

15	Research topic analysis	Group work	Face-to-face	08:00	12.5%	5 / 10	CG13 CE14 CG3 CE13
15	Design of Adaptive Tutoring System	Group work	Face-to-face	00:00	12.5%	5 / 10	CG13 CE14 CG9 CG18 CE13

7.1.2. Global examination

Week	Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
5	Exam	Online test	No Presential	01:00	10%	0 / 10	CG13 CE14 CE13
6	Practical exercise 1	Group work	No Presential	07:00	5%	5 / 10	CG13 CE14 CG3 CE13
7	Practical exercise 1	Group work	No Presential	07:00	5%	5 / 10	CG13 CE14 CG3 CE13
8	Practical exercise 1	Group work	No Presential	20:00	15%	5 / 10	CG13 CE14 CG3 CE13
9	Practical exercise 2	Group work	No Presential	20:00	20%	5 / 10	CG9 CG13 CE14 CG8 CG18 CE13
10	Practical exercise 2	Group work	No Presential	10:00	10%	5 / 10	CG9 CG13 CE14 CG8 CG18 CE13
11	Practical exercise 2	Group work	No Presential	10:00	10%	5 / 10	CG9 CG13 CE14 CG8 CG18 CE13

7.1.3. Referred (re-sit) examination

Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
Practical exercise 1	Individual work	Face-to-face	20:00	30%	5 / 10	CG9 CG13 CE14 CG3 CG8 CG18 CE13
Design of Adaptive Tutoring System	Individual work	Face-to-face	02:00	12.5%	5 / 10	CG13 CE14 CE13
Practical exercise 2	Individual work	Face-to-face	40:00	45%	5 / 10	CG9 CG13 CE14 CG3 CG8 CG18 CE13
Research topic analysis	Individual work	Face-to-face	00:00	12.5%	5 / 10	CE14 CG3 CE13 CG9 CG13

7.2. Assessment criteria

1. Regular Period

1.1. Distributed evaluation

The final grade (FG) will be calculated from the grades of the Practical Exercises (PEG1, PE2G), the Exam grade (EG), the Classroom Participation grade (CPG), the grade of the Design of Adaptive Tutoring System (DTG), and the Research Topic Analysis grade (RTG) by means of the following formula:

FG=0.25*PEG1+ 0.40*PEG2 + 0.10*EG + 0.125*RTG + 0.125*DTG + 0.05CPG, if CPG>=6

FG = 0 otherwise

Where all the grades take values between 0 and 10.

The classroom participation grade stands for the ratio of attendance multiplied by 10. So, students will have to attend at least 60% of the classes to pass the subject in the regular period. However, if a student cannot attend a lesson for some justified reason (job duties, illness, etc.), he/she will be able to compensate for a non-attendance by doing the replacement task required by the professor in due course.

The grades of the passed parts of the subject will be saved for the global evaluation and the Extraordinary period if needed.

1.2. Global evaluation

If the student fails to pass the exam of the distributed evaluation, he/she will have a second chance in the global evaluation by doing another exam, which will determine the exam grade (EG) of the regular period.

If the student fails to pass some of the practical exercises, he/she will have a second chance in the global evaluation to submit the failed practical exercises.

However, given the proximity of the deadline of the research topic analysis and the Design of the Adaptive Tutoring to the global evaluation, it does not make sense that students can submit these assignments in the global evaluation.

2. Extraordinary Period

When failed, in the extraordinary period the final grade will be obtained from the grades of the Practical Exercises (30% + 45%), the grade of the Design of Adaptive Tutoring System (12.5%), and the Research Topic Analysis grade (12.5%).

8. Teaching resources

8.1. Teaching resources for the subject

Name	Type	Notes
Article	Bibliography	Brusilovsky, Peter, and Eva Millán. 2007. "User Models for Adaptive Hypermedia and Adaptive Educational Systems". The Adaptive Web, 3-53. doi:10.1007/978-3-540-72079-9_1.
book	Bibliography	Ricci, Francesco, Lior Rokach, and Bracha Shapira. 2015. Recommender Systems Handbook. Springer-Verlag. Vol. 54. doi:10.1007/978-0-387-85820-3.
book 2	Bibliography	Brusilovsky, Peter, Alfred Kobsa, and Wolfgang Nejdl. 2007. The Adaptive Web: Methods and Strategies of Web Personalization. The Adaptive Web. Vol. 4321. doi:10.1007/978-3-540-72079-9.
Article 2	Bibliography	O'Donnell, E., Lawless, S., Sharp, M., Wade, V. (2015) A Review of Personalised E-Learning: Towards Supporting Learner Diversity. International Journal of Distance Education Technologies, 13(1), 22-47, January-March 2015
book 3	Bibliography	K. Falk. Practical Recommender Systems. 2019. Publisher: Manning Publications

9. Other information

9.1. Other information about the subject

To contact professors, students can use their email addresses included in this document or a Moodle message.

Professors will publish the teaching materials (slides, assignments, etc.) they use throughout the course on the Moodle site of the subject. Additionally, professors will use the Moodle forum to announce key events and provide relevant information on the subject.