

**COURSE DATA****DATA SUBJECT****Code:** 34676**Name:** Intelligent systems**Cycle:** Undergraduate Studies**ECTS Credits:** 6**Academic year:** 2026-27**STUDY (S)**

Degree	Center	Acad. year	Period
1400 - Degree in Computer Engineering	Escola Tècnica Superior d'Enginyeria	3	First quarter
1936 - Double Degree Program in Mathematics-Telematics Engineering	Facultat de Ciències Matemàtiques	4	First quarter

**SUBJECT-MATTER**

Degree	Subject-matter	Character
1400 - Degree in Computer Engineering	Information systems and intelligent systems	COMPULSORY
1936 - Double Degree Program in Mathematics-Telematics Engineering	Cuarto curso	COMPULSORY

**COORDINATION**

BONET ESTEBAN ENRIQUE VICENTE

DOMINGO ESTEVE JUAN DE MATA

**SUMMARY**

The subject "Intelligent Systems" is taught in the first quarter of third year of Computer Engineering, and is largely based on concepts introduced in previous courses of the degree, especially "Discrete Mathematics and Logic" and other related to programming.

Its purpose is to provide an introduction to the field of Artificial Intelligence. Artificial Intelligence includes many advanced programming techniques such as declarative programming, functional programming or object-oriented programming, and uses different methodologies for intelligent problem solving such as heuristic search, the knowledge-based systems, neural networks, agent-based systems. Finally, this type of system is used primarily in issues not satisfactorily resolved by other means and are still subject of research, such as natural language recognition, speech recognition, computer vision, robotics, and so on.

**PREVIOUS KNOWLEDGE**



## RELATIONSHIP TO OTHER SUBJECTS OF THE SAME DEGREE

There are no specified enrollment restrictions with other subjects of the curriculum.

## OTHER REQUIREMENTS

It is advisable to have taken the 'Informática', 'Programación', 'Matemática Discreta y Lógica' (first year) and 'Estructura de Datos y Algoritmos' (second year, first semester) courses prior to taking this course.

## COMPETENCES / LEARNING OUTCOMES

### 1400 - Degree in Computer Engineering

C1 - Ability to know the fundamentals, paradigms and techniques in the field of intelligent systems, and to analyse, design and build computer systems, services and applications that use these techniques in any field of application.

C2 - Ability to acquire, obtain, formalise and represent human knowledge in a computable form for solving problems through a computer system in any field, particularly in those related to aspects of computing, perception and action in intelligent environments.

C3 - Ability to recognise and develop computational learning techniques and to design and implement applications and systems that use them, including those for the automatic retrieval of information and knowledge from large volumes of data.

G4 - Ability to define, evaluate and select hardware and software platforms for the development and implementation of computer systems, services and applications, in accordance with both the knowledge and the specific skills acquired in the degree.

R15 - Knowledge and application of the fundamental principles and basic techniques of intelligent systems and their practical application.

R8 - Ability to analyse, design, build and maintain applications in a robust, secure and efficient manner by choosing the most suitable paradigm and programming languages.

## DESCRIPTION OF CONTENTS

### 1. Introduction

Lecture 1: Introduction

1.1. Objectives and Definitions of Artificial Intelligence

1.2. Division of Artificial Intelligence

1.3. History and current achievements of Artificial Intelligence

1.4. Philosophical problems and future prospects of AI. Weak and strong AI.



## 2. Intelligent Agents

Lecture 2: Intelligent Agents

- 2.1. Concept of intelligent agent
- 2.2. Types of Agents

## 3. Heuristic Search

Lecture 3: Heuristic Search

- 3.1. Representation of search problems: state space
- 3.2. Search methods
  - 3.2.1 Search strategies supported by the information
    - 3.2.1.1. Preferential search for the best.
    - 3.2.1.2. A \*, A \* PI and A\*SRM
    - 3.2.1.3. TABU search.
  - 3.2.2 Trees game
    - 3.2.2.1. Minimax.
      - 3.2.2.1.1. Minimax expected (random elements).
    - 3.2.2.2. Alpha-beta.

## 4. Knowledge Representation

Lecture 4: Knowledge Representation

- 4.1. Knowledge Representation Schemes
  - 4.1.1. Formal logic
  - 4.1.2. Production Rule Systems
  - 4.1.3. Semantic Networks
- 4.2. Incomplete Knowledge Representation Schemes
  - 4.2.1 Reasoning with uncertainty
    - 4.2.1.1. Empirical models: MYCIN, PROSPECTOR.
    - 4.2.1.2. Probabilistic models: Bayesian networks, Modified Prospector, Hidden Markov Models
    - 4.2.1.3. Possibilistic models: Fuzzy Logic

## 5. Symbolic Machine Learning

Lecture 5: Symbolic Machine Learning

- 5.1. Concept and Types of Learning
- 5.2. Syntactic learning: formalisms and algorithms
- 5.3. Statistical learning: formalisms and algorithms
- 5.4. Reinforcement learning



## 6. Neural Networks

Tema 6: Neural Networks

- 6.1. Natural neural networks
- 6.2. Artificial neural networks
- 6.3. Supervised networks
- 6.4. Unsupervised networks
- 6.5. Deep learning
- 6.6. Generative language models

## 7. Laboratory

The labs are designed to develop practical aspects and applications of artificial intelligence, covering topics such as:

1. Knowledge Based Systems.
2. Heuristic search.
3. Game trees.
4. Mechanisms of perception. Sensors, data and internal representations.
5. Vision.
6. Robotics.
7. Planning.

## WORKLOAD

### PRESENCIAL ACTIVITIES

Activity	Hours
Theory	30,00
Laboratory	20,00
Classroom practices	10,00
<b>Total hours</b>	<b>60,00</b>

### NON PRESENCIAL ACTIVITIES

Activity	Hours
Attendance at other activities	0,00
Individual or group project	15,00
Independent study and work	15,00
Preparation of lessons	50,00
Preparation for assessment activities	10,00
Resolution of case studies	0,00
<b>Total hours</b>	<b>90,00</b>

## TEACHING METHODOLOGY



Teaching will consist of a combination of lectures, problem sessions and practical activities to be performed by the student. This teaching will be supplemented by individual work of students, focusing on the study, and problem solving. In addition, there will be sessions on lab work with your computer.

**-The theoretical activities** consist of conducting classes in an hour in which the themes will be developed to provide a global and inclusive, analyzing in detail the key issues and more complex, promoting at all times, the share of students.

**-Hands-on activities** will include conducting meetings of problems and issues in the classroom as well as conducting two seminars, which will address two issues on applications and less formal aspects of the subject.

**-The student's personal work** consists mainly in three aspects:

o *Preparing lessons in advance and reading recommended texts.*

o *Problem solving proposed by professor.*

**-Laboratory sessions** will consist in solving problems related to the theoretical content through software.

## EVALUATION

The evaluation of the course in the first call is conducted by:

- Continuous assessment based on participation and degree of involvement in the teaching-learning process, given regular attendance and classroom activities provided for resolution of issues and problems raised (N\_Continua). This grade cannot be altered in later opportunities.
- Objective test individual, consisting of several tests or knowledge tests, which consist of both theoretical and practical issues and problems (N\_Examenes).
- Assessment of practical activities based on the achievement of objectives in the lab sessions and problems, and the preparation of papers / reports. Occasionally you may make oral presentations (individually and / or group) to evaluate the ability of preparing documents and knowledge transfer (N\_Practicas). This grade cannot be altered in later opportunities, although an exception can be done with at most one practical exercise.

The final grade will be a weighted average of the three grades, with weights inside the respective intervals mentioned in the verification document, which are between 0 and 60% for the objective test, between 10 and 60% for the assessment of practical activities, between 10 and 60% for the continuous assessment and between 20 and 40% for the assessment of the laboratory activities, where all weights must add up exactly 100%.



An average grade of 5 out of 10 or higher will be required to pass the course. At least a grade of 4.5 or more out of 10 will be requested in the individual exams and in the laboratory activities to make an average. Otherwise, the subject will be considered as fail.

Alumni that, due to laboral reasons or other of similar nature that will have to be documentally proved cannot assist to the lab sessions will have to agree with the lecturers an avaluation system that will involve in all cases the delivering of homeworks or lab reports due on time and possibly a personal interview for their assessment. No out-of-term lab reports will be admitted neither will be allowed such works specifically intended for the second call.

At the second call, there will be an exam about the contents and activities of the course. The final grade will be a weighted average of the three grades. In order to pass the course, a grade of 4.5 out of 10 or higher will be required in the exam. No minimal grade will be required for the part/s not able to be altered.

The use of automatic code generation tools or answers based on language models / artificial intelligence tools must be expressly stated in the assignments, exercises or practices, and is expressly prohibited in the exams. The suspicion of the use of these methods in an exam or of their use without express manifestation in other activities may be verified a posteriori by the teacher through a personal interview with witnesses.

In any case, the evaluation of this subject will be done in compliance with the University regulations in this regard, approved by the Governing Council on 30<sup>th</sup> May 2017 (AGCUV 108/2017). Copying or plagiarism of any activity that is part of the evaluation will result in the impossibility of passing the course, and the student will then be subject to the appropriate disciplinary procedures indicated in the ACTION PROTOCOL FOR FRAUDULENT PRACTICES AT THE UNIVERSITY OF VALENCIA ([ACGUV 123/2020](#)).

## REFERENCES

- Inteligencia Artificial: Un Enfoque Moderno, S. Russell, Prentice Hall, 2<sup>a</sup> ed, 2005.
- Fundamentos de Inteligencia Artificial, L.A. Munárriz, Universidad de Murcia, 1994.
- Neural Networks, a systematic approach. Raúl Rojas. Springer-Verlag, Berlin, 1996