

Degree programme	Type	Course
Bachelor in Artificial Intelligence	FB	1

Contact lecturer

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Teaching staff (external to UAB)

Roger Deulofeu Batllori

Group languages

You can consult this information at the [end](#) of the document.

Prerequisites

There are no prerequisites.

Objectives

Whether as a method for knowledge representation, as a reasoning system, as an analytical tool or even as a programming language, logic has played a prominent role in artificial intelligence (AI) since the origins of the discipline. The aim of this course is therefore to explore the role of logic within AI, providing students with an understanding of its fundamental concepts, techniques and methods, so that they can apply them to these different dimensions of AI.

At the same time, the course aims to contribute to the development of abstract thinking and logical reasoning, which are essential skills in the training of future AI engineers, both for formalising problems and for analysing structures, evaluating inferences and justifying solutions rigorously.

Learning outcomes

- CM06 (Integrate reasoning strategies based on logic modelling and search algorithms into AI applications) Integrate reasoning strategies based on logic modelling and search algorithms into AI applications
- KM19 (Explain the concepts of problem modelling in logical languages and their resolution using satisfactory-based algorithms.) Explain the concepts of problem modelling in logical languages and their resolution using satisfactory-based algorithms.
- SM22 (Apply modelling with logical formalisms and methods of satisfying constraints in the resolution of reasoning problems in artificial intelligence.) Apply modelling with logical formalisms and methods of satisfying constraints in the resolution of reasoning problems in artificial intelligence.

Contents

I. Brief Introduction to Set Theory

- The notion of set, element and membership; ways of defining a set by extension and by comprehension.
- Basic operations with sets: union, intersection, difference, complement, and inclusion.
- Cartesian product and ordered pairs as a basis for the study of relations and functions.

II. Propositional Logic (Truth-Functional Logic, TFL)

- Syntax of TFL: alphabet, connectives, statements, etc.
- Semantics of TFL: truth-functional connectives, characteristic truth tables, complete truth tables, and partial truth tables.
- Formalization of natural language using TFL and its limitations.
- Reasoning in TFL. Natural deduction.
- Normal forms and data structures.

III. First-Order Logic (FOL)

- Syntax of FOL: quantifiers, formulas, statements, etc.
- Semantics of FOL: extensionality, interpretations, etc.
- Formalization of natural language using FOL and its limitations.
- Resolution in FOL: transformation of formulas into normal forms.

Learning activities and methodology

Title	Hours	ECTS	Learning outcomes
Introduction and discussion of the main theoretical concepts	30	1.2	KM19
Exercise in class	14	0.56	SM22
Practical exercises in class	24	0.96	CM06, SM22
Preparing and solving exercises	25	1	SM22
Autonomous work and readings	25	1	CM06

The course methodology is based on short lectures by the professor, problem-solving during class time and flipped learning (that is, students will complete the lectures with readings and work at home). In some classes, time will be kept for reviewing and correcting the evaluative practices.

There will be a weekly classroom-based practical component, in which students will work both individually and

collectively.

Annotation: within the schedule set by the centre or degree programme, 15 minutes of one class will be reserved for students to evaluate their lecturers and their courses or modules through questionnaires.

Assessment

Continuous assessment activities

Title	Weight	Hours	ECTS	Learning outcomes
Partial exam 2	35%	12	0.48	CM06, KM19, SM22
Practical exercises	30%	8	0.32	CM06, SM22
Partial exam 1	35%	12	0.48	CM06, KM19, SM22

Assessment may be carried out in two ways: single assessment or continuous assessment.

Continuous assessment

Continuous assessment consists of two midterm exams, each worth 35% of the final grade, and a set of practical assignments to be completed weekly, worth 30%. In order to pass the course, students must obtain a minimum final grade of 5, calculated as the weighted average of the three components, and the minimum grade for each midterm exam may not be lower than 3.5. If the grade for one of the midterm exams is lower than 3.5, that part must be retaken in the resit exam, even if the average grade of the three assessment activities is 5 or higher.

In order to be assessed for the practical assignments component, students must have submitted at least 8 practical assignments.

Single assessment

Single assessment will consist of one exam, worth 100% of the final grade. Students who choose single assessment must submit, on the day of the exam, all the practical assignments completed during the course, following the instructions provided by the teaching staff, as a condition for being allowed to sit the exam.

Resit

In order to sit the resit exam, the average grade of the three assessment activities, in the case of continuous assessment, or the grade of the exam, in the case of single assessment, must be equal to or higher than 3.5. For students following continuous assessment, the resit will consist of an exam that may take one of three forms: resit of the first midterm exam, resit of the second midterm exam, or resit of both midterm exams. For students following single assessment, the resit will consist of one single exam.

Review of grades

After each assessment activity, the teaching staff will inform students via Moodle of the grades obtained, as well as of the procedure and date for grade review.

Not assessable

Students will receive a "Not assessable" grade if they do not sit one of the two midterm exams, in the case of continuous assessment, or if they do not sit the single assessment exam.

Irregularities

Any irregularity that may significantly alter the grade of an assessment activity will result in a grade of zero for

that activity. In the event of multiple irregularities, the final grade for the course will be zero, regardless of any disciplinary proceedings.

Exchange students who request to take an exam earlier than scheduled must submit to the instructor a written document from their home university justifying their request.

Bibliography

Basic:

P. D. Magnus (2021) *Forallx*, University at Albany. With additions under a Creative Commons License by T. Button, J. R. Loftis, and R. Trueman, <http://forallx.openlogicproject.org/>.

Complementary:

Ben-Ari, M. (2012). *Mathematical logic for computer science*. Springer Science & Business Media.

Badesa, C., Jané, I., & Ferrer, R. J. (2019). *Elementos de lógica formal*. Ariel.

van Benthem, J., van Ditmarsch, H., van Eijck, J. & J. Jaspars. (2016). *Logic in Action*. Open Course Project, 2016, <https://www.logicinaction.org/>.

Zhang, H, & J. Zhang (2025). *Logic in Computer Science*. Springer.

Software

To be determined.

Course groups and languages

The information provided is provisional until November 30. After this date, you will be able to consult the language of each group through this [link](#). To access the information, you will need to enter the course CODE

Type of teaching	Group	Language	Semester	Shift
(PAUL) Classroom practices	1	English	first semester	afternoon
(TE) Theory	71	English	first semester	afternoon