



Course guide

270726 - LAI - Logics for Artificial Intelligence

Last modified: 02/02/2024

Unit in charge: Barcelona School of Informatics
Teaching unit: 1042 - URV - Universitat Rovira i Virgili.

Degree: MASTER'S DEGREE IN ARTIFICIAL INTELLIGENCE (Syllabus 2017). (Optional subject).

Academic year: 2023 **ECTS Credits:** 6.0 **Languages:** English

LECTURER

Coordinating lecturer: ANTONIO MORENO RIBAS

Others:

PRIOR SKILLS

It is not necessary to have taken an introductory course on Logic.

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:

CEA13. Capability to understand advanced techniques of Modeling , Reasoning and Problem Solving, and to know how to design, implement and apply these techniques in the development of intelligent applications, services or systems.

CEP3. Capacity for applying Artificial Intelligence techniques in technological and industrial environments to improve quality and productivity.

CEP5. Capability to design new tools and new techniques of Artificial Intelligence in professional practice.

Generical:

CG1. Capability to plan, design and implement products, processes, services and facilities in all areas of Artificial Intelligence.

CG3. Capacity for modeling, calculation, simulation, development and implementation in technology and company engineering centers, particularly in research, development and innovation in all areas related to Artificial Intelligence.

Transversal:

CT4. EFFECTIVE USE OF INFORMATION RESOURCES: Managing the acquisition, structuring, analysis and display of data and information in the chosen area of specialisation and critically assessing the results obtained.

CT6. REASONING: Capability to evaluate and analyze on a reasoned and critical way about situations, projects, proposals, reports and scientific-technical surveys. Capability to argue the reasons that explain or justify such situations, proposals, etc..

TEACHING METHODOLOGY

Teaching methodologies:

- * Lectures.
- * Sessions with student participation.
- * Autonomous work.
- * Tutoring sessions.
- * Preparation of evaluation tests.



LEARNING OBJECTIVES OF THE SUBJECT

1. Understand the basic tools of Mathematical Logic and their use as a knowledge representation and reasoning mechanism within an intelligent system.
2. Know how to apply the tools of Mathematical Logic to solve specific problems.

STUDY LOAD

Type	Hours	Percentage
Hours large group	20,0	13.33
Hours medium group	20,0	13.33
Guided activities	4,0	2.67
Hours small group	10,0	6.67
Self study	96,0	64.00

Total learning time: 150 h

CONTENTS

First-Order Logic

Description:

Use of first-order logic as a mechanism for knowledge representation and reasoning.
Formalisation. Natural Deduction. Resolution. Model Theory.

Logic Programming

Description:

Logic programming: facts and rules. Backwards reasoning. Cut operator. Negation as failure.

Description logics.

Description:

Description logics. Language: concepts, roles and constants. Operators to define complex concepts. Reasoning mechanisms.

Inheritance networks.

Description:

Defeasible reasoning on inheritance networks. Positive and negative links and paths. Admissible links and paths. Credulous extensions. Types of reasoning.

Default reasoning.

Description:

Closed world reasoning. Circumscription. Default logic. Autoepistemic logic.

ACTIVITIES

Lectures

Description:

Lectures that cover the theoretical content of the course.

Specific objectives:

1

Related competencies :

CG3. Capacity for modeling, calculation, simulation, development and implementation in technology and company engineering centers, particularly in research, development and innovation in all areas related to Artificial Intelligence.

CEA13. Capability to understand advanced techniques of Modeling , Reasoning and Problem Solving, and to know how to design, implement and apply these techniques in the development of intelligent applications, services or systems.

CT4. EFFECTIVE USE OF INFORMATION RESOURCES: Managing the acquisition, structuring, analysis and display of data and information in the chosen area of specialisation and critically assessing the results obtained.

Full-or-part-time: 30h

Theory classes: 30h

Problem sessions

Description:

Discussion of exercises on the topics covered in the course

Specific objectives:

2

Related competencies :

CG1. Capability to plan, design and implement products, processes, services and facilities in all areas of Artificial Intelligence.

CEP3. Capacity for applying Artificial Intelligence techniques in technological and industrial environments to improve quality and productivity.

CEA13. Capability to understand advanced techniques of Modeling , Reasoning and Problem Solving, and to know how to design, implement and apply these techniques in the development of intelligent applications, services or systems.

CEP5. Capability to design new tools and new techniques of Artificial Intelligence in professional practice.

CT6. REASONING: Capability to evaluate and analyze on a reasoned and critical way about situations, projects, proposals, reports and scientific-technical surveys. Capability to argue the reasons that explain or justify such situations, proposals, etc..

Full-or-part-time: 15h

Practical classes: 15h



Exercises

Description:

Exercises solved in class during the semester

Specific objectives:

2

Related competencies :

CG1. Capability to plan, design and implement products, processes, services and facilities in all areas of Artificial Intelligence.

CEP3. Capacity for applying Artificial Intelligence techniques in technological and industrial environments to improve quality and productivity.

CEA13. Capability to understand advanced techniques of Modeling , Reasoning and Problem Solving, and to know how to design, implement and apply these techniques in the development of intelligent applications, services or systems.

CEP5. Capability to design new tools and new techniques of Artificial Intelligence in professional practice.

CT6. REASONING: Capability to evaluate and analyze on a reasoned and critical way about situations, projects, proposals, reports and scientific-technical surveys. Capability to argue the reasons that explain or justify such situations, proposals, etc..

Full-or-part-time: 40h

Self study: 40h

Final exam

Description:

Theoretical exam

Specific objectives:

1

Related competencies :

CG3. Capacity for modeling, calculation, simulation, development and implementation in technology and company engineering centers, particularly in research, development and innovation in all areas related to Artificial Intelligence.

CEA13. Capability to understand advanced techniques of Modeling , Reasoning and Problem Solving, and to know how to design, implement and apply these techniques in the development of intelligent applications, services or systems.

CT4. EFFECTIVE USE OF INFORMATION RESOURCES: Managing the acquisition, structuring, analysis and display of data and information in the chosen area of specialisation and critically assessing the results obtained.

Full-or-part-time: 65h

Self study: 65h

GRADING SYSTEM

Final exam: 50%.

Individual exercises: 50%.

BIBLIOGRAPHY

Basic:

- Brachman, R.J.; Levesque, H.J. Knowledge representation and reasoning. Amsterdam: Elsevier, 2004. ISBN 1558609326.

Complementary:

- Nisanke, N. Introductory logic and sets for computer scientists. 1st. Harlow: Addison Wesley Longman, 1999. ISBN 0201179571.



RESOURCES

Hyperlink:

- <https://campusvirtual.urv.cat>