

DEGREE CURRICULUM COMPUTATIONAL LOGIC

Coordination: MARTINEZ RODRIGUEZ, SANTIAGO

Academic year 2023-24

Subject's general information

Subject name	COMPUTATIONAL LOGIC						
Code	102366						
Semester	1st Q(SEMESTER) CONTINUED EVALUATION						
Typology	Degree	Course	Character	Modality			
	Bachelor's degree in Digital Interaction and Computing Techniques	1	COMMON/CORE	Attendance- based			
Course number of credits (ECTS)	6						
Type of activity, credits, and groups	Only examination						
Coordination	MARTINEZ RODRIGUEZ, SANTIAGO						
Department	COMPUTER ENGINEERING AND DIGITAL DESIGN						
Teaching load distribution between lectures and independent student work	6 ECTS = 25x6 = 150 working hours. There are no classes for this subject.						
Important information on data processing	Consult this link for more information.						
Language	Catalan.						
Distribution of credits	There are no classes for this subject.						

Teaching staff	E-mail addresses	Credits taught by teacher	Office and hour of attention
MARTINEZ RODRIGUEZ, SANTIAGO	santi.martinez@udl.cat	0	Arrange with the teacher. Optionally, by videoconference.

Subject's extra information

To address this subject, properly skills on analysis and logical reasoning are recommended.

For any question, please, send an email to the teacher.

Learning objectives

At the end of the course, the student will be able to:

- Model sentences in propositional logic.
- · Reason about the validity of propositional logic formulas.
- Apply systems of automatic reasoning to propositional logic formulas.
- Model sentences in first order logic.
- Reason about the validity of first order logic formulas.
- Apply systems of automatic reasoning to first order logic formulas.

Competences

Basic Competences

• **B01**. That students have demonstrated to possess and understand knowledge in an area of study that starts from the base of general secondary education, and is usually found at a level that, although supported by advanced textbooks, also includes some aspects that imply knowledge coming from the vanguard of his/her field of study.

Transversal Competences

- CT3. Acquire training in the use of new technologies and information and communication technologies.
- CT5. Acquire essential notions of scientific thought.

General Competences

- CG2. Design, develop, evaluate and guarantee the accessibility, ergonomics, usability and security of computer systems.
- CG3. Use adequate hardware and software platforms to develop and execute interactive digital applications.
- CG5. Know the basic subject areas and technologies needed to learn and develop new methods and technologies, and those that help to adapt to new situations.
- CG7. Solve problems through initiative, determination, independence and creativity.
- CG8. Capacity for abstraction and critical, logical and mathematical reasoning.

Specific Competences

- CE2. Capacity to understand and master the basic concepts of discrete mathematics, logics, algorithmic and computational complexity, and its application to solve computational problems.
- CE3. Basic knowledge of the use and programming of computers, operating systems and databases, and their use in the development of interactive applications.
- CE4. Capacity to know, understand and evaluate the structure and architecture of computers, as well as the basic components that conform them.
- CE16. Capacity to design and evaluate person-computer interfaces that guarantee the usability of systems, services and computer applications.
- CE17. Capacity to apply knowledge on design to propose and defend a design concept for an interactive system and use proper creative technologies to develop each project.
- CE24. Capacity to understand the human factors involved in any interactive process between humans and technology, as well as being able to adequately apply them in the design of interactive products and services, and their interfaces.

Subject contents

The contents of the subject are the following:

Unit 1: Introduction to Logic Systems and Automated Reasoning

Unit 2: Propositional Logic

- Syntax, Semantics and Truth Tables
- Taxonomy of Sentences (satisfiable, unsatisfiable and tautology)
- Logic Equivalence, Equisatisfiability and Logic Consequence
- Modelling Sentences
- Normal Forms: Translations into Clausal Form
- Resolution Principle
- · Automated Reasoning to Prove Validity of Formulas

Unit 3: First Order Logic

- Syntax and Semantics
- Taxonomy of Sentences (satisfiable, unsatisfiable and tautology)
- Logic Equivalence
- Modelling Sentences
- Substitution, Composition of Substitutions and Application of Substitutions to Expressions
- Unification of Expressions and Most General Unifier
- Normal Forms: Translations into Clausal Form
- Resolution Principle
- · Automated Reasoning to Prove Validity of Formulas

Methodology

There are no classes for this subject.

However, the student who wishes may attend, as an auditor, the equivalent subject (Computational Logic) of the Degree in Computer Engineering that is taught on the same Igualada campus.

Development plan

There are no classes for this subject.

Evaluation

The continuous evaluation of the subject is based on three blocks:

- Theory block 1 (35%): It consists of one activity: 1st Midterm Exam. It can be improved. A minimum grade is not required. Date of the exam: the date of the realization of the 1st Midterm Exam, defined by the EPS.
- Theory block 2 (40%): It consists of one activity: 2nd Midterm Exam. It can be improved. A minimum grade is not required. Date of the exam: the date of the realization of the 2nd Midterm Exam, defined by the EPS.
- Practice block (25%): It consists of one activity: Practice. It cannot be improved. A minimum grade is not required.

Improvement of Theory blocks: It consists on performing Midterm Exams again. A minimum grade is not required. Date of the exams: the date of the realization of the Improvement Exam, defined by the EPS. The realization of improvement exams does not condition the maximum grade achieved in the subject.

Evaluation activities

Acronym	Evaluation Activity	Weight	Minimum Score	Group	Compulsory	Recoverable
EP1	1st Midterm Exam	35%	No	No	No	Yes
EP2	2nd Midterm Exam	40%	No	No	No	Yes
PRA	Practice	25%	No	Yes (≤ 2)	No	No
PCL	Participation in Class	0.5 p.	No	No	No	No

Acronym	Evaluation Activity	Weight	Minimum Score	Group	Compulsory	Recoverable
To pass the subject the final score must be \geq 5.						
Final Score = 0.35 · EP1 + 0.4 · EP2 + 0.25 · PRA + PCL						

Remarks:

If the final score < 5, the student can recover the midterm exams (the student can choose one exam or both).

Alternative evaluation (students who waive continuous evaluation):

Students who have the approval to be evaluated by alternative evaluation (see requirements and procedure in the evaluation regulations) will have to do the following activities.

- **Single exam** (100%): It can be improved. Date of the exam: the date of the realization of the 2nd Midterm Exam, defined by the EPS. This exam consists of a written test of the entire subject matter.
- Improvement of Single exam (100%): Date of the exam: the date of the realization of the Improvement Exam, defined by the EPS. The realization of the improvement exam does not condition the maximum grade achieved in the subject.

Bibliography

Basic

- Teresa Hortalá, Narciso Martí, Miguel Palomino, Mario Rodríguez, Rafael del Vado: Lógica matemática para informáticos. Pearson, Prentice Hall, 2008.
- Enrique Paniagua, Juan Luís Sánchez, Fernando Martín: Lógica computacional. Thomson-Paraninfo, 2003.
- John Wylie Lloyd: Foundations of Logic Programming. Springer-Verlag, second edition, 1987.

Complementary

- Jean H. Gallier: Logic for Computer Science: Foundations of Automatic Theorem Proving, 2003 (http://www.cis.upenn.edu/~jean/gbooks/logic.html).
- Uwe Schöning: Logic for Computer Scientists. Birkhäuser, Boston, 1989.
- Tom Tymoczko, Jim Henle: Razón, dulce razón: Una Guía de Campo de la Lógica Moderna. Ariel, 2002.