

Course guide

270725 - CPP - Constraint Processing and Programming

Last modified: 25/07/2025

Unit in charge: Barcelona School of Informatics
Teaching unit: 723 - CS - Department of Computer Science.

Degree: MASTER'S DEGREE IN INFORMATICS ENGINEERING (Syllabus 2012). (Optional subject).
MASTER'S DEGREE IN ARTIFICIAL INTELLIGENCE (Syllabus 2017). (Optional subject).

Academic year: 2025 **ECTS Credits:** 4.5 **Languages:** English

LECTURER

Coordinating lecturer: FRANCISCO JAVIER LARROSA BONDIA

Others: Primer quadrimestre:
FRANCISCO JAVIER LARROSA BONDIA - 10

PRIOR SKILLS

Basic Algorithmics

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:

CEA1. Capability to understand the basic principles of the Multiagent Systems operation main techniques , and to know how to use them in the environment of an intelligent service or system.

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.

Generical:

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

Transversal:

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

For the modeling part, the "flipped classroom" system will be used where students will have to watch videos and do small projects. Class hours will be used to resolve doubts and consolidate knowledge.

For the part of resolution techniques, the classic master class methodology and some class of problems will be used.

LEARNING OBJECTIVES OF THE SUBJECT

1.Ability to model optimally a discrete optimization problem and solve it using the proper tools.



STUDY LOAD

Type	Hours	Percentage
Self study	72,0	64.00
Hours large group	40,5	36.00

Total learning time: 112.5 h

CONTENTS

Modeling combinatorial problems

Solving with Constraint Programming

Solving with Propositional Logic (SAT)

Description:

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Solving with integer linear programming

Description:

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ACTIVITIES

Modeling

Specific objectives:

1

Related competencies :

CEA1. Capability to understand the basic principles of the Multiagent Systems operation main techniques , and to know how to use them in the environment of an intelligent service or system.

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

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: 73h

Practical classes: 10h

Laboratory classes: 13h

Self study: 50h

Constraint Programming

Specific objectives:

1

Related competencies :

CEA1. Capability to understand the basic principles of the Multiagent Systems operation main techniques , and to know how to use them in the environment of an intelligent service or system.

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.

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

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: 10h

Theory classes: 4h

Practical classes: 1h

Self study: 5h

Boolean Satisfiability

Full-or-part-time: 11h

Theory classes: 5h

Practical classes: 1h

Self study: 5h

Integer Linear Programming

Full-or-part-time: 10h

Theory classes: 4h

Practical classes: 1h

Self study: 5h

GRADING SYSTEM

Throughout the course, small projects (around 6) will be carried out with a combined weight of 30% of the final grade. There will also be a quiz at the beginning of the course, a partial exam and a final exam with a total weight of around 70% of the grade

BIBLIOGRAPHY

Basic:

- Rossi, Francesca; Van Beek, Peter; Walsh, Toby. Handbook of constraint programming [Recurs electrònic] [on line]. Amsterdam ; Boston : Elsevier, 2006 [Consultation : 18/12/2024]. Available on : <https://www-sciencedirect-com.recursos.biblioteca.upc.edu/bookseries/foundations-of-artificial-intelligence/vol/2/suppl/C>. ISBN 9780444527264.

- Biere, Armin; Heule, Marijn; Maaren, Hans van; Walsh, Toby. Handbook of satisfiability [on line]. 2nd ed. Washington: IOS Press, 2021 [Consultation : 18/12/2024]. Available on : <https://ebookcentral-proquest-com.recursos.biblioteca.upc.edu/lib/upcatalunya-ebooks/detail.action?pq-origsite=primo&docID=28617772>. ISBN 9781643681603.

- Van Hentenryck, Pascal; Michel, Laurent. Constraint-based local search. Cambridge, Mass. ; London: MIT Press, cop. 2005. ISBN 9780262220774.