

**Introduction to Problem Solving and Algorithm Design**

Code: 102151  
ECTS Credits: 6

Degree	Type	Year	Semester
2501232 Business and Information Technology	OB	1	1

## Contact

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## Use of languages

Principal working language: catalan (cat)  
Some groups entirely in English: No  
Some groups entirely in Catalan: Yes  
Some groups entirely in Spanish: No

## Prerequisites

Being a subject taught in the first semester of the degree, no specific prior knowledge is needed.

## Objectives and Contextualisation

This is a first semester course, designed to familiarize students with tasks involved in tackling real-life problem solving. This will be a significant responsibility for many graduates in Business and Information Technology, particularly in the areas related with decision-making and business information management.

In this sense, the basic aims of the course are:

- To be able to describe the essential elements summarizing a problem, as well as the basic strategies that can be adopted for solving it.
- Understand the role of different components of the problem both in its contextualization and definition, and in making subsequent decisions.
- Identify the characteristics of situations and problems which resolution can be "automated" by means of algorithms.
- Understand the basic structures that can be used in algorithm design.
- To be familiar with some of the most common algorithms used in a business environment.

After completing the course, students should be able to address the basic modeling of a situation and use specific skills for solving problems. In particular, they should be able to present and argue solutions (and features taken into account in decision-making) for initially poorly defined problems in which sophisticated quantitative tools are not required.

## Content

The course is divided in two parts, each one with two units. The first part deals with the conceptualization of complex problems; the second one focuses on solving well-structured problems through algorithmic techniques.

### Unit 1. The art of problem solving

This first unit aims at presenting the various elements needed in the analysis of a "problematic situation". It also considers methodologies to obtain a solution satisfying given criteria or other criteria formulated during the analysis itself. Particularly, we will deal with:

- Basic methodologies to understand the background of a problem, including graphic analysis and creative thinking. We will also consider problems arising from preconceptions and mechanisms to effectively establishing working assumptions.
- Various definitions of solution according to the scope and possibilities of action.
- The role of different approaches to problem solving, such as simulation or the use of methodologies that are considered "typical" of other disciplines.

## **Unit 2. Problem solving and decision making**

The unit introduces the role of modelling for solving "complex" problem situations. Building models should allow "informed" choices, based on a scientific analysis of the consequences of such decisions. In particular, the following items will be considered:

- Components of the analysis of "complex" situations: definition of a suitable model; role of the various actors; determination of external factors and controllable elements.
- Cause and effect analysis: the solution of a problem considered as an element of change in the original situation.
- Decision making and validation of the "best" solution to a given situation.

## **Unit 3. Basic algorithmic structures as an approach to "automatic" problem solving**

The aim of the unit is the introduction of the main elements describing an algorithm and its use in different contexts. In particular:

- The concept of algorithm and its application to various fields of work
- Methods of specifying an algorithm: flowcharts, pseudocode and programming languages
- Linear algorithms.
- Non-linear control structures: alternative, iterative and recurrent schemes.
- Applications to the determination of algorithmic solutions to simple problems.

## **Unit 4. Towards good algorithm design**

The unit offers a more in-depth knowledge on algorithm design, providing some basic tools to enhance simple "functioning" algorithms. We will consider how to write easy-to-follow well-structured algorithms, having desirable qualities: correctness, generality, simplicity, efficiency.