UAB
Universitat Autònoma de Barcelona

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

Name: Gloria Estapé Dubreuil

Email: Gloria.Estape@uab.cat

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.