Assignment: Constraint Satisfaction Problem for Semester 2 Timetable Scheduling

Objective:

In this assignment, you will use a Constraint Satisfaction Problem (CSP) by formulating the problem, defining variable domains, and implementing constraints. Subsequently, you will develop an application that uses backtracking algorithms where you can add AC3 algorithm as preprocessing step to reduce domains values **besides {MRV,MCV,LCV }** adjusted to your problems (use your own concept) ,… to generate a feasible timetable for the (1CS) students for Semester 2 for one group.

Problem Formulation, Variable Domains, and Constraints:

The first step in this assignment is to formulate the problem by identifying variables, defining their domains, and specifying the constraints. Constraints ensure that the timetable adheres to the given requirements, such as the maximum number of workdays for each teacher and the distribution of courses across days and time slots.

Constraints: we have two types od constraints , you start with the hard ones than you can add soft constraints

1. **Hard (basic)Constraints**:

- The week consists of five days: Sunday, Monday, Tuesday, Wednesday, and Thursday.
- Each day has five work slots, except Tuesday which has only three in the morning.
- Four or five successive slots of work are not accepted. (max three successive slots)
- Lectures of the same course should not be scheduled in the same slot.
- Different courses for the same group should have different slot allocations.

2**. Soft Constraints: (FAcultatifs and will be graded as extra grades)**

- Each teacher should have a maximum of two days of work.

Task:

Your task is to develop an application that formulates the problem, defines variable domains, implements constraints, and employs backtracking algorithms , AC3 and MRV ,…to generate a good timetable. Ensure that the timetable satisfies the hard constraints and aims to satisfy as many soft constraints as possible.

Problem Description:

You are tasked with scheduling the timetable for Semester 2 for the 1st-year Computer Science students. The courses and their corresponding requirements are provided below:

For each group :

Sécurité (one lecture + one td) **Teacher 1**

Méthodes formelles (one lecture + one td) **teacher 2**

Analyse numérique (one lecture + one td) **teacher 3**

Entrepreneuriat (one lecture) **teacher 4**

Recherche opérationnelle 2 (one lecture + one td) **teacher 5**

Distributed Architecture & Intensive Computing (one lecture + one td) **teacher 6**

Réseaux 2 ((one lecture + one td) **teacher 7**+ one tp(**teacher 8,teacher 9 ,teacher 10**))

Artificial Intelligence ((one lecture + one td) **teacher 11**+ one tp(**teacher12,teacher 13,teacher14**))

-----*Number of teachers is delivered in your original time table*

Deliverables:

1. Application: Develop a program/application that follows the problem formulation, variable domains, and constraints specified above. You can start with ***python constraint package*** or other

2. **Report**: Write a report with details of your approach to problem formulation, variable domains, constraint implementation, and the use of backtracking algorithms. Discuss any challenges encountered and how you addressed them. (submitted for td grading)

Group Members:

Work in groups of two from same group

Deadline:

The deadline for submission is defined by tp teacher.

For the report you will receive your classroom submission space.