

# CS5205: Advanced Artificial Intelligence Lab

## Assignment - 5

20/02/2026

You need prepare schedule for a set of short term courses. Let us assume that there are  $n$  number of courses. All these courses need to be conducted in  $m$  number of rooms. Each course (say  $i$ -th) needs to be conducted for  $t_i$  number of days. Each course has a preferred start day  $s_i$  and a deadline  $d_i$  by which it has to be completed. While preparing the schedule you need to take care of the following. A course should run on consecutive days, that is, there is no day-break given for any course. Each course should be conducted only on single room on all days. Given the above information, does there exist a schedule such that all courses can be completed for its stipulated duration within the respective deadline? A sample input is provided below.

```
% number of rooms
M 5

% number of short-term-courses
N 10

% course details
% course id start-day end-day duration
C 1 4 10 3
C 2 7 20 6
C 3 8 27 10
...
```

- Develop SAT-based formulation to model the problem using the following encoding schemes. You need to generate DIMACS file for a given inputs and then run Z3 on the same.
  - Option-1:  $z_{ijt}$  —  $i$ -th course starts on day  $t$  in room no  $j$
  - Option-2:  $x_{ij}$  —  $i$ -th course is assigned to  $j$ -th room,  $y_{it}$  —  $i$ -th course starts on day  $t$
- Which encoding scheme is better? You need to analyze this based on number of variables, clauses, clauses with 2/3/3+ literals, computation time, memory usage, etc.
- Explore the performance of different encoding schemes using various solvers. Apart from Z3, use two other SAT solvers from satcompetition.
- Write a generator that will generate 100 random test-cases. Apply both encoding schemes, run SAT solvers and observe the performance.

You need to submit source code (assg05.py or assg05.cpp) and 'report.pdf'. The report should contain the set of variables, the constraints, and a comparative study of results from different SAT solvers.