The approach to the 2nd track of ITC2007

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As summarized in Algorithm 1, our approach is composed of two phases, a tabu search phase and a simulated annealing phase.

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Initialization (Using an insertion heuristic)
while tabu search stopping criterion is not met do
    generate new solutions with four move operators;
    select the best non-tabu solution;
    solution and tabu list updating;
end
while simulated annealing stopping criterion is not met do
    generate new solutions with four move operators;
    solution and temperature updating;
end
```

Algorithm 1: Outline of the approach

Representation: A solution is represented as a timetable matrix X and an 0-1 array Y, where $x_{ij} \in X$ denotes the event (e.g., lecture) scheduled in room i and timeslot j, while $Y_i = 1$ if event i is scheduled and $Y_i = 0$, otherwise.

Objective function: The objective function is defined as the weighted sum of the distance to feasibility and soft cost ($dtf(S)$ and $sc(S)$, respectively), i.e., $f(S) = w * dtf(S) + sc(S)$, where $w \gg 1$ indicates the priority of $dtf(S)$.

Initialization: We initialize the algorithm with an insertion heuristic. Firstly, X is set to empty with all the events unscheduled. Then the events are inserted into X one at a time. Concretely, the events without order constraints are considered first. These events are selected in descending order by their sizes (number of participants), and inserted in the optimal empty position of the current X. Then the events with order constraints are inserted according to the constraints. The insertion process terminates when there is no valid position for the left events.

Move operators: During the tabu search and simulated annealing, new solutions are generated by four move operators: move, swap, delete and add. In "move", a scheduled event is moved to another empty position in X. In "swap", two events exchange their positions in X. The delete operator removes a scheduled event from X, while the add operator inserts an unscheduled event in an empty position of X. Every time when the move, swap or delete operator is

applied, it is followed by the add operator trying to find out a solution with a lower value of dtf unless there is no unscheduled event left.

Stopping criteria: The algorithm terminates when both the tabu search and simulated annealing phases have terminated. The tabu search stops if the best solution found so far has been unchanged for two iterations while the simulated annealing terminates when the temperature has reduced to a predefined lower bound or a predefined time limit has been reached.