**OPTIMIZATION METHODS AND ALGORITHMS**

**PROBLEM FORMALIZATION**

|  |  |  |  |
| --- | --- | --- | --- |
|  | NOTATION: | Domain: |  |
| 1 |  |  | Student index |
| 2 |  |  | Exam index |
| 3 |  |  | Timeslot index |
| 4 |  |  | Auxiliary timeslot index |
| 5 | *i* |  | Difference between timeslots index |
|  |  |  |  |
|  | **DATA:** |  |  |
|  |  | Total number of student enrolled in at least 1 exam | |
|  |  | Total number of exams | |
|  |  | 1 if student *q*  is enrolled in exam *j*, 0 o/w | |
|  |  | Number of available timeslots | |
|  |  |  |  |
|  | **VARIABLES:** |  |  |
| 1 |  |  | 1 if exam *j* is scheduled on timeslot *h*, 0 o/w |
| 2 |  |  | 1 if student *q* is occupied during timeslot *h*, 0 o/w |
| 3 |  |  | 1 if student *q*  is occupied in both timeslots *h* and *k*, 0 o/w |
|  |  |  |  |
|  | **CONSTRAINTS:** |  |  |
| 1 |  |  | Each exam will have one and only one time slot |
| 2 |  |  | Student *q*  cannot be enrolled in more exams which are in the same timeslot, hence the sum of all exams in which student *q*  is enrolled and which takes place in timeslot *k* is 1 or 0. |
| 3 |  |  | zq,k is 1 if student *q* is occupied in timeslot *k*, 0 o/w. |
| 4 |  |  | uq,h,k is 1 if student *q*  is occupied in both timeslots *h* and *k*, 0 o/w. |
|  |  |  |  |
|  | **COST FUNCTION:** |  | |
|  |  |  | |
|  |  |  | |
|  | **OBJECTIVE FUNCTION:** |  |  |
|  |  |  | For each distance *i* between timeslots that generates a penalty (1,2,3,4,5) we sum the cost function generated by each timeslot configuration.  i.e. for each distance between timeslots that generates a penalty, we multiply the corrispective cost () by the number of students which are occupied both in timeslot h and *h+i*. This number of students is calculated summing over all students the boolean variable which is 1 if student *q* is occupied in timeslots h and *h*+*i* and 0 o/w. |