



## Timetable planner GHC-User's guide

*This guide is not intended to be a complete reference, there is a detailed contextual help from the same application. You can also use the video tutorials on the Peñalara website.*

### Content

<b>INSTALLING GHC .....</b>	<b>2</b>
WEB PEÑALARA .....	2
ACTIVATION KEYS .....	2
USER LICENSE .....	2
HELP AND TROUBLESHOOTING .....	2
UNINSTALLING PREVIOUS VERSIONS .....	2
<b>BEFORE STARTING .....</b>	<b>2</b>
IMPORTING KEYS AND EXPORTING SCHEDULES .....	2
APPLICATION PROFILE .....	3
WHAT GHC DOES .....	3
LEARN HOW TO USE IT .....	3
PROCESSES OF GHC .....	3
HOW TO USE THE DATA FILES .....	3
FILES USED BY THE APPLICATION .....	3
HOW TO USE GHC IN STEPS .....	4
SETTING THE TIME FRAME .....	4
INSERT NEW ITEMS .....	5
INITIAL VALUES AND PROPERTIES .....	5
THE OCCUPATION TEMPLATES .....	5
<b>THE LISTS OF DATA .....</b>	<b>6</b>
GRADES .....	6
SUBJECTS .....	6
GROUPS OF STUDENTS .....	6
DEPARTMENTS .....	6
TEACHERS .....	6
CLASSROOMS .....	6
ALTERNATIVE CLASSROOM SETS .....	7
CLASS UNITS .....	7
ELECTIVE SUBJECTS SETS .....	8
TEACHER MEETINGS .....	8
ON-CALL HOURS .....	8
TASKS .....	8
COMPLEMENTARY ACTIVITIES OR OTHER TASKS .....	8
WEIGHTED CRITERIA FOR THE OPTIMIZATION .....	9

<b>DATA VALIDATION .....</b>	<b>9</b>
OPEN A RESULT WITH THE SCHEDULE PLANNER .....	9
<b>SCHEDULE ENGINE .....</b>	<b>10</b>
NOT PLACED ELEMENTS AND STATISTICS .....	10
WARNING MESSAGES .....	10
<b>SCHEDULE EDITOR .....</b>	<b>11</b>
PRESENTATION AND MODIFICATION OF SCHEDULES .....	11
MOVE CLASS UNITS .....	11
EXTRACT AND ADD SCHEDULE CLASS UNITS .....	11
COMMAND MODIFY CLASS UNITS .....	12
COMMAND 'CHANGE OR ADD NAME' .....	12
COMMAND 'CREATE ELEMENTS' .....	12
ADJUST THE CLASSROOMS MANUALLY .....	12
INSERT BREAKS SUPERVISION .....	12
LISTS PRINTING .....	13
EXPORT OF RESULTS .....	13
CHANGE TO OTHER FORMATS .....	13
THE XML-GHC EXCHANGE FORMAT .....	13
<b>ANSWERS TO SOME FREQUENTLY ASKED QUESTIONS .....</b>	<b>14</b>
HOW TO SET THE TIME FRAME .....	14
HOW TO CONDITION THE CLASSROOMS .....	14
ONLY ONE TEACHING PERIOD OF A COURSE IS SPLIT .....	14
SOME OF THE CLASS UNITS OF A COURSE ARE IN A DIFFERENT CLASSROOM .....	15
GROUPS WITH SPECIAL NEEDS STUDENTS .....	15
FOUR MONTH SUBJECTS OR IN ALTERNATE WEEKS .....	15
ASSISTANCE TO RETAKE SUBJECTS .....	16
FIT TUTORIAL HOURS .....	16
TUTORIALS IN PRIMARY EDUCATION .....	16
GROUPS OF STUDENTS IN REMOTE TEACHING SPACES .....	16
SET A TOTAL WEEKLY DURATION WITH FRACTIONAL PERIODS .....	16
CONFIGURE VOCATIONAL EDUCATION .....	16
SET THE MINIMUM / MAXIMUM NUMBER OF DAILY TEACHING PERIODS .....	17
NO RESULTS FOUND .....	17
TO IMPROVE THE RESULTS .....	17
WORKING WITH SEVERAL RESULTS .....	18
MODIFYING RESULTS .....	18
PLANNING THE ASSESSMENT BOARD MEETINGS .....	18
<b>APPENDIX 1: PRIMARY EDUCATION .....</b>	<b>19</b>
<b>APPENDIX 2: HIGHER EDUCATION .....</b>	<b>19</b>
<b>APPENDIX 3: CONSERVATORIES OF MUSIC AND INDIVIDUALIZED TEACHING .....</b>	<b>20</b>
<b>APPENDIX 4: GROUPS ASSISTANT .....</b>	<b>20</b>
<b>APPENDIX 5: FILE PLATFORM .....</b>	<b>21</b>
<b>APPENDIX 6: MORE THAN A WEEK .....</b>	<b>21</b>

## Installing GHC

### Requirements

The use of GHC requires at least Windows 7.

**i** From other operating systems you can also use GHC with a Windows emulator.

### Web Peñalara

The installation of GHC is done by downloading the installation file. You can use the address [www.penalara.com](http://www.penalara.com) to find the latest version of GHC, as well as further information and help.

**i** If you are connected to the Internet, the program will automatically indicate you if there is an update.



### Activation keys

You must activate each installation by entering your user credentials. If you do not have them you need to register as a GHC user.

**i** You can use GHC with up to 10 teachers for 15 days for free. If you get a subscription you can continue to work with your data.

### User license

This application is offered through subscriptions that are renewed annually. Do not hesitate to contact us to consult the different subscription modalities that are offered together with our service.

**i** To receive support and maintenance it is necessary to subscribe to GHC.

### Help and troubleshooting

You can receive the help you need using the technical support and incident online service on de GHC website, through email or phone call.

**i** Please, if necessary, you can attach to your message the files you are working with, detailing the problem you may have encountered, so that we can provide you with an accurate solution to your particular case.

### Uninstalling previous versions


If you wish, you can easily uninstall GHC from your computers. However, installing a new version of GHC will uninstall the old version.

Uninstalling older versions of GHC does not delete configuration data files or schedules that may exist, which means that they can be opened from new versions of the program.

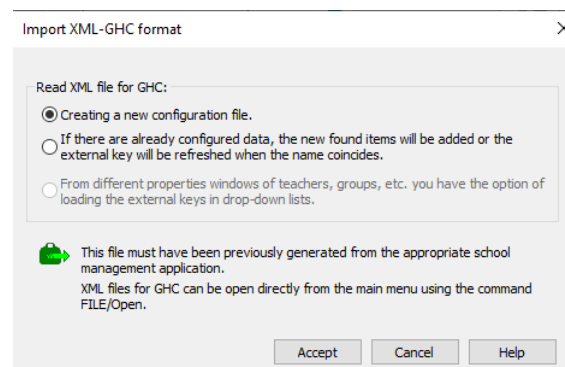
**i** From the file whith an outcome you will also be able to retrieve the configuration data with which it was obtained. To do this, open the result file on the planner, and you will recover the original configuration, optionally also prefixing the positions of the result.

### Before starting

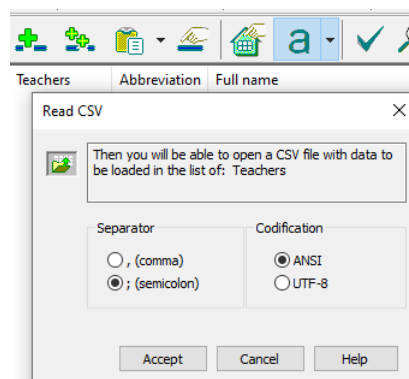
#### Importing keys and exporting schedules

 This command allows you to bring lists of groups, subjects, teachers, etc. from the school management application you use. It avoiding having to enter all this data manually and, more importantly, making it possible to transfer the schedule.

To transfer timetables to another computer application, the elements that make up this schedule (subjects, groups, teachers, etc.) must correspond with the internal keys of the application that will receive it. Currently, this exchange is possible with various management applications, both to collect data and to transfer the outcome.



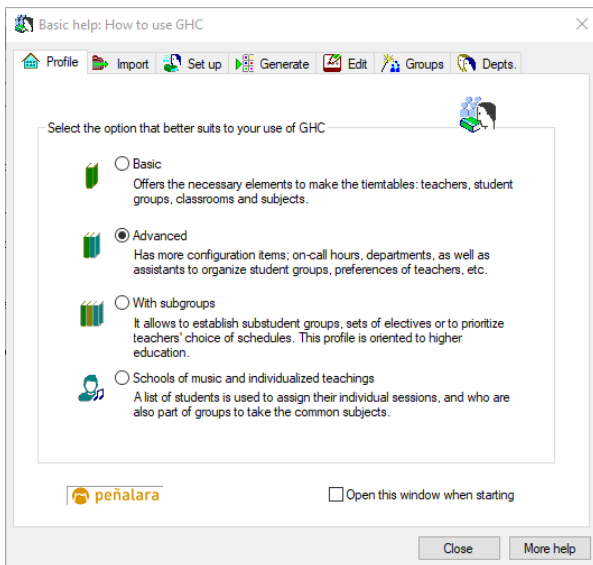
**i** You can also bring the configuration data from any external application using CSV files



**i** These exchange processes are subject to continuous maintenance work. Update GHC, and do not hesitate to consult to the technical support service for any problems or difficulties you encounter with the exchange process.

## Application profile

The application profile aims to enable access to the functions that are used in the educational institution for which the schedule is being elaborated.




There are three types of application profiles for in GHC:

- **Basic:** This type of profile offers features and operations normally required in primary schools. For example, it. Lets you define several time frame, split groups, etc.
- **Advanced:** in addition to the characteristics of the basic profile, there are more elements and operations for scheduling in high schools, such as the group assistant, the process of receiving requests by departments, etc.
- **With subgroups:** It is oriented for universities, allowing to prioritize the choice of the schedule, as well as to establish different constraints among departments.
- **Schools of music and individualized teachings:** The list of groups of students is replaced by a list of individual students, assigned to individual subjects or grouped for common subjects.

## What GHC does


The aim of this application is to create optimal schedules for groups of students and teachers, with maximum use of classrooms. GHC is able to consider the wide diversity of constraints that normally occur in schools; both hard constraints (mandatory conditions) and soft constraints (preferential conditions).


 *Schedules for teachers not only become globally optimal, but they also become balanced.*

This application obtains schedules automatically; this is the reason why its design is oriented to work with the implementation of the constraints that must fit the results. It is necessary to introduce the elements that configure the schedule, for example the elements or class units to fit, and it are also necessary to set the constraints, along with their corresponding optimization criteria. The engine will obtain the solutions that are an optimal compromise for the whole educational institution.

## Learn how to use it

The best way to learn how to use GHC is by practice. This application will be more intuitive to you if you are accustomed to Windows. Use contextual help and experiment with the different options.

 *It also has contextual help accessible from the program.*

 *See FAQ at the end of this guide for answers to the most frequently asked questions about using GHC.*

## Processes of GHC

This application consists of several processes running on the system independently:

- **Planner:** configure the initial data to fit.
- **Engine:** generate and optimize results.
- **Editor:** show and edit the results.




In addition, it has other tools:

- Exchange of data with other applications.
- File Platform.
- Setting preferences of teachers
- A manager for the absence and substitution of teachers.

## How to use the data files

GHC can be installed on several computers or at different stations in a local network, but it does not provide concurrent access to the data.

 *There is an option to merge separately generated configuration files.*

## Files used by the application

The 'File Platform' process is part of GHC and will help you manage and share your files. See below for more information.



The types of files or documents that GHC handles are:



**Configuration data:** Extension **.XGHC**. Associated with the schedule planning process; contains the necessary data to obtain schedules.



**Resolved schedule:** They have extension **.XRHO**. Contains a schedule generated by the engine. It is added an **R #** suffix to the configuration data file name (this type of file is described above), **#** being a number following a sequence.



*If the configuration file is called **DATA.XGHC**, the results will be: **DATAR1.XRHO**, **DATAR2.XRHO**, etc.*



Table drawn from a resolved schedule **.GRI** extension associated with the schedule editor.

## How to use GHC in steps

### 1. -Import data (optional)

GHC allows the import of the necessary data to configure the schedule, together with its corresponding external keys. Importing your data saves time and allows transferring the finished schedule so that it is correctly interpreted by the application that receives it.

### 2. -Group assistant (optional, see appendix at the end of this file).

This assistant can be useful to organize the elective subjects that will be taught to different groups of students of each grade.

### 3. -Setting preferences of teachers (optional, see appendix at the end of this file).

This module is meant to collect the preferences of the teachers. They can select specific subjects as their preference to teach them. In addition to subjects, they can have other preferences.

### 4. -Configuring the schedule.

It is necessary to configure the general time frame of the schedule, and to introduce the class units that will fit, and their constraints, which can be either hard or soft constraints. It is also necessary to adjust the optimization criteria.



*There should not be more hard constraints than necessary. To obtain the best possible schedules, it is preferable to set soft constraints rather than hard constraints. I.e. use preferences instead of prohibitions if possible; alternative classrooms, variable weekly distribution, etc. The engine will seek the most favorable compromise according to the entered weight of the constraints.*

### 5. -Generate results with the engine.

Using the schedule engine you can check if there are results for the configured conditions. You can adjust the preferences and weights to receive the best result possible for your requirements.



*As you enter new data, for example with each new group of students, you can try to generate results. This can help you to debug conflicting data.*



*Frequently, the greatest difficulty in the use of GHC is to redefine the constraints that make the results impossible. Therefore, it is preferable to use soft constraints (non-mandatory) that do not impede the solutions. This will facilitate the obtaining of the best resolved schedules.*

### 6. -Retouch, present and export.

From the schedule editor you can modify the finished schedule keeping its structure and validity. You can move or add class units, change the rooms, etc.



*Before retouching the resulted schedule, make sure that you have obtained complete and optimal results, using the schedule engine, based on the configuration data required by your educational institution.*

## Setting the time frame

In this window it is established:

- The total number of **teaching spaces** including all those where a subject is taught. For example, if a schoolyard is used for physical education, it should also be included.
- The **number of periods** per day.
- Stop at **noon and breaks**.
- **Starting time and finishing time** of each of the periods.
- **External keys** of days and intervals.
- In the **general template** you can indicate the times without activity in the educational institution. These times will be disabled in all the particular templates.



*The time frame can be modified while the schedule is being sketched.*

### Number of weeks with different Schedule

See appendix on this guide: *More than a week.*

### Overlapping schedules

Use this option when you need to define overlapping schedules, i.e. when at least an period of a schedule covers two periods of another schedule. You can then assign each time frame to the group of students that it corresponds.



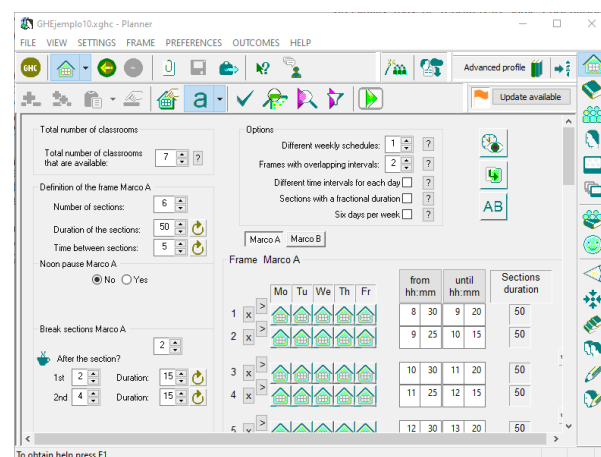
*Starting times and finishing times should be carefully defined in case of overlapping, since they will be important to determine the relationship between the different time frames.*

### Different schedule for each day of the week

You can optionally set different schedules for each day of the week. In this case, the templates and resolved schedules will always be shown by aligning the first period of all the schedules.

### There are periods with a fractional duration

It is allowed to define some periods of the time frame with a duration of  $\frac{3}{4}$  or  $\frac{1}{2}$  of the duration of a "normal" period. This possibility may be required in some educational institutions with primary education. See the corresponding appendix in this guide for more information.



## Insert new items



Use the command "Insert new item" from:

1. The toolbar.
2. The main menu or the contextual menu.
3. Using the *Insert* key of the keyboard.



*When introducing new teachers, subjects, etc. only a name will be asked to identify them.*

Teachers	Abbreviation	Full name	Department
Alice		Alice full name	Languages
Andrew		Andrew full name	Culture and art

- **Name:** It is the key used to identify and relate the elements between the different lists.
- **Abbreviation:** It can contain repeated values.
- **Full name:** Used in some lists.
- **External key:** It will correspond to the key of the application to which you want to export the schedule.



*You can modify any of these fields at any time. In any case, the external key must correspond to the key of the application to which you want to export the schedule so that it can be interpreted correctly by the external application.*

## Initial values and properties

### General options and initial values



From this window, general parameters for the generation of schedules are configured. In addition, the initial values can be established and when new teachers or new teaching class units are inserted, they will take some of their attributes.



*From the window of initial values you can also assign the same value to all the elements already entered in the list using the [a List] button.*



*In any case, you can specify the value of each element of the list of teachers, etc. using its corresponding properties window.*

General options, initial values and other actions

Profile Options Free periods Other options Tasks

Class units Operations Remote groups Notes

This data will be used when inserting new class units.  
WARNING: Use the button [to list] to assign to all the class units that are already introduced.

☒ Penalize more than 50% of the class units at first hour

☒ Penalize more than 50% of the class units at last hour

☒ Penalize the matching between the last hour and the first of the following day

☒ Penalize more than 50% of the class units after the break

☒ Penalize the matching between these class units in the afternoon

Coincidence in the time slot for these class units:

☒ In different slot ☐ Irrelevant ☐ In the same time slot

☒ Do not allow breaks between class units of multiple duration

☒ Breaks divide consecutive class units

In the case of class units on different days or subjects with 2 or 3 class units per week:

☐ Irrelevant if they are or are not in consecutive days.

In alternative days (non-consecutive):

☒ Preferably in alternative days, depending on the weight.

☐ Force to be taught in alternative days.

All consecutive days:

☐ Preferably in consecutive days, depending on the weight.

☐ Forcing necessarily in consecutive days.

☒ Consider always that Monday is consecutive to Friday

Accept Cancel Ayuda

## The properties window



Each element of each of the lists has a window where it is possible to manage its attributes. To open the corresponding properties window you must select the item in the list, and then use:

1. The button on the toolbar.
2. The option of the main menu or the contextual menu.
3. The top button located above the occupation template.
4. The *tab* key.

Properties of the teacher Alice

Identifiers Free periods Compaction Daily occupation Preferences

Identifier: Alice

Abbreviation:

Take office:

External key:

Full name: Alice full name

Department: Languages

## The occupation templates

Alice					
#	Mo	Tu	We	Th	Fr
1	☹️	☹️	☹️	☹️	☹️
2	☹️	☹️	☹️	☹️	☹️
3	☹️	☹️	☹️	☹️	☹️
4	☹️	☹️	☹️	☹️	☹️

Each element of each of the lists also has an associated template whose positions that can indicate:



**Not allowed:** prohibited position.



**Available:** not prohibited.



**Non-preferential:** lower weight.



**Non-preferential +:** higher weight.



**Deactivated:** if it is prohibited in the general template.



**Preset:** if it is a preset position.



*Some positions with the red background may appear in the templates of the class units. This indicates a prohibition on the template of any of its assigned elements. For example, if a teacher's template has a prohibited position, it will be reflected in their class units.*



*Only in the case of overlapping time frames, a green background means that there is an overlapping prohibition in another time frame, which is not reflected in the current one.*



*Avoid setting prohibited positions that can impede or force solutions. Use non-preferred positions whenever possible, weighting them for optimization.*



*To obtain more equitable results, try to put the same number of non-preferred positions to all teachers.*



## The lists of data

### Grades



They are the levels in which the different groups of students are framed, normally corresponding to their age. The grade may have associated subjects that correspond to it according to the study program. The subjects can be elective or mandatory.

The subjects associated with the grades are used:

- In the selection filters of the subjects for the configuration of the class units.
- In the assistant to organize the groups of students of each grade (see appendix).

### Subjects



This list contains the subjects that are assigned to the class units. All the class units that fit into the schedule will be associated with a subject. The subject can be organized by belonging to the different grades to facilitate its management.

### Groups of students



The groups of students are assigned directly to the class units that fit into the schedule.

It is possible to copy previously assigned class units from one group to another new group of students.



*Use the group assistant to organize the elective subjects that are taught to the groups of students of each course (see appendix).*



*In the templates of the groups of students, the needed number of positions to fit their weekly class units will normally available. The optimization process is designed to take the unoccupied periods to the ends of the schedule, and to the positions that are indicated as non-preferential.*

*To set up groups for students with special needs, see FAQ at the end of this guide: answers to frequently asked questions.*

### Departments



This list is used to associate teachers, subjects and class units to each department. This list is necessary for the operation of:

- The filters of the selection of teachers in the configuration of the class units.
- The process of setting of preferences (see appendix).

## Teachers



Various options can be configured for teachers, such as the possibility of establishing free days or free periods, etc.

In some cases you can choose whether these constraints are established as hard constraints or soft weighted constraints.



*The maximum and the minimum number of daily class units of each teacher can be established as a hard constraint.*



*The maximum and minimum number of daily class units are calculated automatically from the total number of weekly class units and working days (not prohibited) of the teacher.*



*In the list of teachers the icon 'thumbtack' means that it has some of its class units preseted.*

## Classrooms



When configuring the time frame, the total number of available teaching spaces must be indicated. It is not necessary, however, to explicitly declare all these teaching spaces in the list of classrooms.

When registering a classroom they are assigned a predetermined type:

- **<General>**: general purpose classrooms. The anonymous classrooms are always of this type.
- **<Reserved>**: not belonging to the previous set of normal classrooms.

To fit the class units, the schedule engine will use all the classrooms belonging to a given set, depending on the flexibility that has been given in each case.



*To learn more about how to set up the classrooms, you can find FAQ and answers at the end of this guide.*

## Alternative classroom sets



They are sets of classrooms that are formed to offer an alternative location to the class units. The same classroom can be part of several sets of alternative classrooms. Each set of classrooms is identified with a name invented by the user.

There is a predefined set for general purpose classrooms called type <general>.



*The set of predefined <general> classrooms is made up of all the anonymous classrooms as well as those that have registered as such.*

This way, the class units can be configured to be taught in:

- A fixed classroom without alternative classrooms; <no>.
- A classroom <any> of a set of classrooms.
- A preferred classroom, also expressing a set of alternative classrooms.



*Offering a set of alternative classrooms for the different class units, although a preferential classroom is indicated, provides great flexibility to the schedules and helps to obtain better results.*

## Class units



The elements of this list are associated to a course, a group, a teacher, a weekly distribution, a classroom, etc. They can be expressed with up to 5 or 6 weekly class units, with a duration that can be from 1 to 5 periods. For example, 221 would be three class units, two double class units and one simple.



*Optionally, in the properties window, you can offer a more flexible distribution. For example, 4 weekly periods could be distributed as 4, 3-1, 2-2, etc., giving flexibility as appropriate to the result.*



*You can prefix the position of some or all of them on the template of each chain of class units. The engine will respect this condition unless it is impossible to fit the full schedule.*

## Simultaneous class units

Add simultaneous class units by selecting the line in the list of class units to be added and then use one of the following commands:

	Insert a simultaneous class unit in other classroom	F7
	Insert other group in the classroom	F8
	Insert other teacher in the classroom	F9
	Insert other classroom to the teacher	F10
	Insert other subject in the classroom	F11
	Insert more students in the classroom	F12
	Make simultaneous class units (also drag and drop)	



Simultaneous class units can also be done and undone by dragging and dropping directly on the same list of class units.

	Classical	3º A	Rachel	1	A-31	< no >
	Classical	3º B	Rachel	1	A-31	< no >
	French	3º A	Alice	1	< any >	< general >
	French	3º B	Alice	1	< any >	< general >
	Computing	3º A	Philip	1	< any >	< general >
	Computing	3º B	Philip	1	< any >	< general >

In the picture above it can be seen how you can graphically express any combination of simultaneous class units you need. For example, in the previous image, two groups are recombined to take three subjects with three different teachers and three different classrooms.

	Technology	3º B	Ernest	2	< any >	< general >
	Technology	3º A	Ernest	2	< any >	< general >
	Technology	3º B	Nuria	2	< any >	< general >

In this other picture, another teacher is added to the same classroom in which students from two groups meet for technology class.

## Properties of the class units



In addition to the aforementioned, other conditions can be maintained between the different lines or blocks of the list of teaching class units:



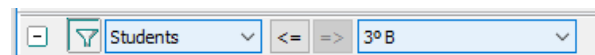
- On a **different day** of the week.
- In **consecutive hours**.
- In **non-consecutive** hours, etc.

## Other options for each block of class units:

- Penalize that they coincide in the first or last periods of the day.
- Penalize that they coincide in the afternoon.
- Penalize that they coincide at the same time.
- Do not allow breaks between the double class units.
- Do not allow all class units on consecutive days.

## Class units that appear in the list

When the list of class units is opened, a toolbar appears where you can select the class units that appear in the list.



## Filtering of the drop-down lists by the grade or the department.

- Using the grade filter, the drop-down lists will contain the subjects and the groups of students of that grade.
- Using the department filter, the drop-down lists will contain those teachers that belong to a certain department.



In this list there is also a command to copy a line or string of class units.



There is the possibility of giving certain flexibility to the assignment of teacher to certain groups of students allowing the exchange of teachers who have been assigned. For example, teachers X and Y could teach mathematics to either group A or B.

## Elective subjects sets.



The sets of elective subjects contain subjects of the same group of students.



If there is more than one group of students in a chain of simultaneous class units, this chain cannot be part of the set of elective subjects.

These sets of elective subjects are useful to configure the elective subjects in a university environment. But they can also be used for high schools or to set up a split teaching period of laboratory.



Frequently, to configure the elective subjects, it is preferable to establish simultaneous class units (see simultaneous class units in the previous topic). This will be the case when the elective subjects are taught simultaneously.



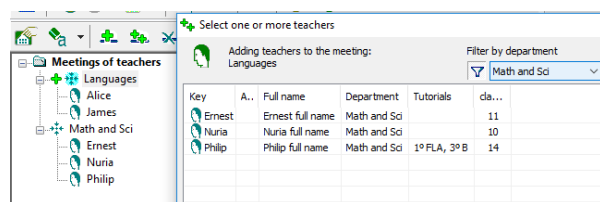
It is generally favourable to configure sets of elective subjects when it is not necessary to determine exactly how all the class units overlap one another.

## Teacher meetings



Teacher meetings are composed of the meeting identifier and the list of members.

To add teachers to the meeting, use the menu command 'add teachers'.



The meetings also have:

- Weekly frequency.
- Template to establish when it can be held.
- Single or double duration.



It is not always possible to fit teacher meetings during school hours.

## On-call hours



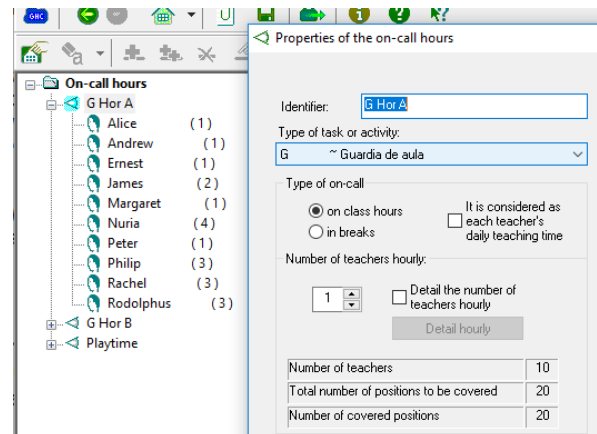
The duties are composed of an identification of the service, for example, library supervisions, and a list of teachers. There are also duties for supervisions of the school breaks.

Teachers get added with the "add teacher" command, asking for a number of weekly hours in the service to which they are added.

In the properties window of each of the on-call services, the maximum number of teachers that will cover each hour is indicated.



If there are more on-call hours to cover than hours assigned to the teachers, the engine will try to have at least one teacher per duty hour.



If the opposite is the case, i.e. if more on-call hours have been assigned to the teachers than there are positions to place them, the engine will not find results unless you select an option to discard the unplaced on-call hours. This option is available in the window of general options and initial values.

## Tasks

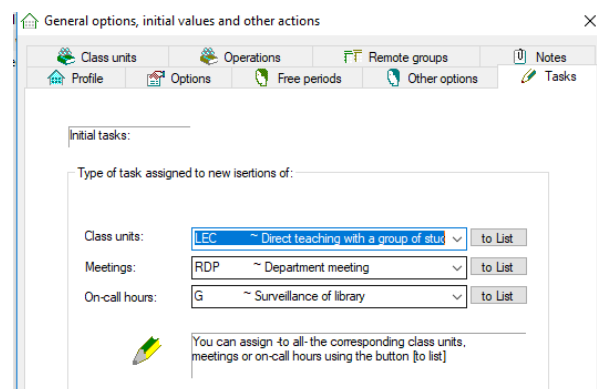


The list of tasks or types of activity maintains different identifiers that can be assigned to the class units, meetings, duties and also as other complementary activities.

When adding new class units, a default type of task will be assigned. In all cases, the task or type of associated activity will appear as one more attribute in its corresponding properties window.



In the general options window you can modify the tasks set as initial values that are used when adding new elements.



## Complementary activities or other tasks



They are tasks that are associated with a teacher with a specific weekly load.

These activities will be distributed throughout the week with a maximum daily limit. You can also optionally allow that daily periods do not necessarily have to be consecutive.



Complementary activities can be moved and also be easily added to the final result using the schedule editor.



## Weighted criteria for the optimization



This window allows you to establish a weight relative to the different optimization criteria. Attending to these values, the engine will look for an optimal compromise making the most favorable changes. The final result will be the one with the minimum weight.

Weighting affects the results more for the relative value that it gives to some criteria with respect to others than for the individual value.



*The total weight of a result is not a value that can be used to compare results generated with different conditions. Its usefulness lies in evaluating whether a certain combination is positive in order to achieve the optimal compromise.*

Consult the contextual help from the program to obtain a detailed description of each of the criteria.



**Weighted criteria:** These are conditions to which a numerical weight is granted so that the engine can look for an optimal compromise.



**Weight:** Numeric value that is given to each option for the optimization process. The greater the weight, the more importance that option will have for the result.

For example, the higher the weight for the unoccupied periods, the more they will be avoided.

## Data validation



Before generating results it is convenient to validate the configuration data. The validation will inform us of possible causes of conflict, for example, between the positions available in the occupation templates and the number of assigned class periods.

Validation messages can be:



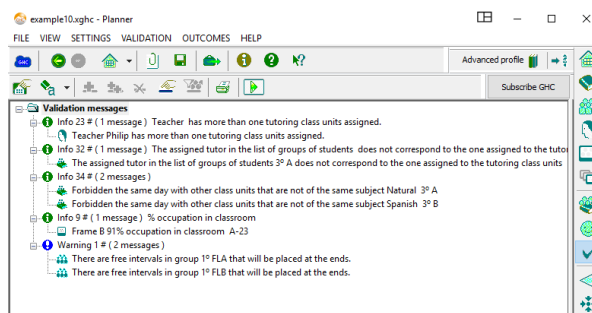
**Warnings:** They may not make the results impossible and may not even be significant in some cases.



**Errors:** They prevent the program to find results. You must debug them to find full results.



**Information:** Report possible causes that can make finding the results difficult.



*The fact that there are no validation errors does not mean that there will be results. There are often conflicts that prevent full results but that could not be detected in the validation.*



*See the FAQ section at the end of this manual for more help on debugging errors that impede results.*

## Open a result with the schedule planner

Another possibility offered by the program is to directly open a resulted schedule (.XRHO file) using the scheduler. This will recover the original configuration from which it was obtained, giving the option to preset the positions of the result on the templates of the different elements.



**Project a result:** it consists in uploading a schedule on the planner, presetting the position on the templates of all the elements: class units, meetings, on-call hours and other activities.

Materia	Grupo	Profesor	Tmp	Aula	Aulas Alt
TI4D	DI4C	P083	111	AG40	< no >
#	L	M	Mi	J	V
1					
2					
3					
4					

If we start the schedule engine again from the projection, the same resulted schedule will be obtained, at least in terms of the position of class units, meetings, etc. The assigned classrooms in some cases could vary.



*Projecting a result can be useful to keep it partially. For example, to add duties or complementary class units, or to pick up modifications that have happened to schedules already delivered.*



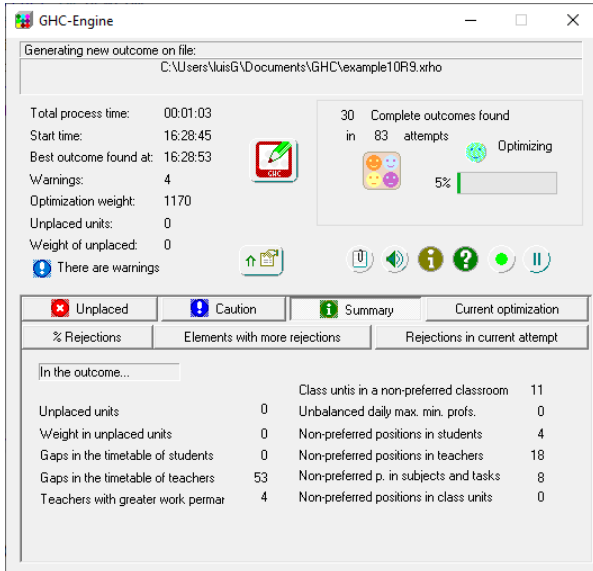
*If the finished schedule has been modified from the schedule editor in contravention of the configured conditions, the projection of that finished schedule does not generate again with the engine. To generate it again, it has to fulfil the configured conditions.*

## Schedule Engine



The Schedule Engine looks for complete results fitting all the class units that have been configured with the scheduler. If the engine finds these complete results, it makes them optimal.

In any case, it will keep only the best result of all those that it found, i.e. the best of the complete results that were found, or the least incomplete if it is impossible to fit all the class units.



This process will not end until the user indicates it. You may want to stop the schedule engine due to one of these reasons:

- You need to modify the configuration when you do not find complete results.
- Results are found but you want to improve them. You can improve them by modifying the constraints.
- Finally take the found result as optimal.

The time needed to verify any of these situations can be very variable; from a few moments to check that the engine is not finding complete results after several attempts, up to some hours to fully fit and optimize the schedule of a particularly large or complicated educational institution.



*The harder to fit in the schedule all the class units, the harder to optimize.*



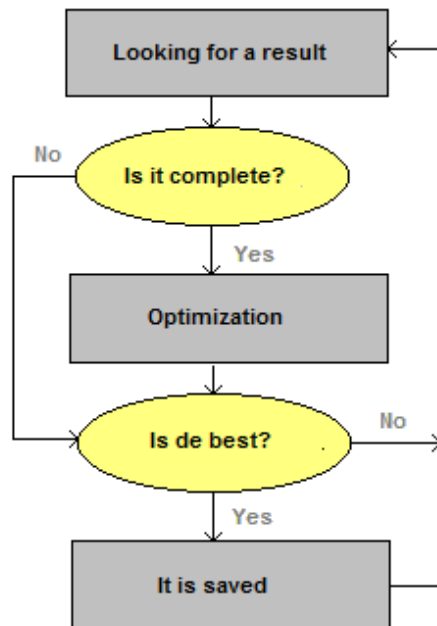
*Each time the engine is started, only the best of the found results will be kept. However, it is possible to start several engines that will run simultaneously, each one working on a different result.*

To form the name of the resulted schedule, the program adds the suffix **R #** to the name of the data, where **#** is a number in sequence. For example the first result of **mydata.XGHC** would be **mydataR1.XRHO**



*There is a configuration option in the planner that makes the engine always prefer complete results with the least number of non-preferred positions in the group schedules. In this case, their global weight will be compared only when more than one results have the same number of non-preferred positions.*

## Optimum basic diagram



### Not placed elements and statistics

In each attempt to find complete results, the schedule engine informs the user of those circumstances around which there is greater difficulty to fit the class units. This information can be useful for debugging conflicts that may make it difficult or impossible to obtain results.



- **List of non-placed elements:** If the best result is an incomplete result, the engine presents the list of class units, meetings or on-call hours that could not be placed.
- **Class units with most rejections:** The list of class units that have suffered the most rejections when looking for results.
- **% of difficulty:** These are two lists with the percentage of accumulated rejections. One of the lists corresponds to groups of students and the other list corresponds to teachers.
- **Other summary data:** total non-occupied periods in teachers' schedules, etc. They only appear if a complete, optimized result is reached.

### Warning messages

These messages, if any, will disappear as better results are generated and optimized.



*If they do not disappear, it is generally due to an excess of prohibitions or hard constraints, making it impossible to optimize the constraints.*



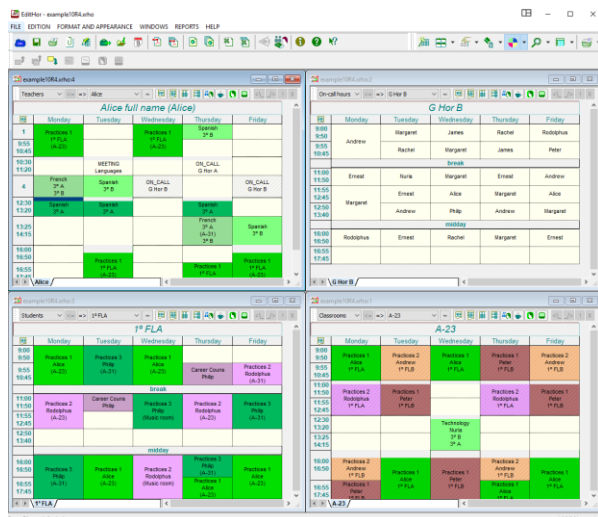
**Priority warnings:** For example, unoccupied periods in group schedule. They must be established in the general configuration options, s. The optimization process will minimize these warnings as a priority.

## Schedule editor

### Presentation and modification of schedules



The schedule editor is used to show the results generated by the engine. You can choose different views of the result, which allow you to make changes. You can also extract independent tables for free editing. From this editor you can convert the finished schedule to different formats, making it possible to transfer it to other applications.



Document used to keep a full schedule.



**XRHO extension:** Result generated by the schedule engine. The XRHO files contains the schedules obtained by the engine. On these documents you can modify the result keeping its structure and validity, i.e. you can move or add class units, change the classroom, etc. The program will check that these operations are possible to perform.



*On the resulted schedule, the editor helps you modify the schedule validating its integrity.*

- **Move** class units by drag and drop operation.
- **Extract and add** class units from a list of not placed elements.
- **Modify the assignments of the class units, meetings and on-call hours.** For example, modify the teacher, etc. It can be done with all the periods of the subjects.
- **Modify the identifiers or add** new teachers, subjects, groups, classrooms, etc.
- **Create new class units**, complementary activities, meetings or duties.
- Change the **fixed signs** and the headers of the tables: days of the week, hours of entry, etc.
- Assign **other classroom** to the class units.
- Introduce **breaks supervision**, etc.



On a complete result you can show the schedules of teachers, groups, classrooms, on-call hours, etc. You can show them in different views: simple tables, with list, general, etc. being able to keep these views in different tabs or in different windows.



You can create new views of the schedule in a separate window.



### Move class units

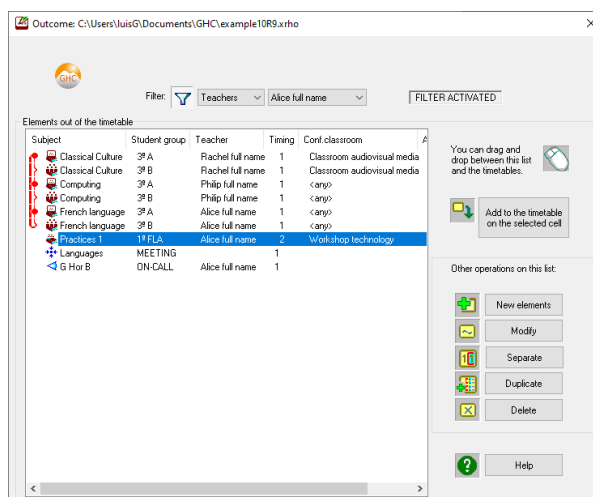


You can move class units within the same schedule using drag-and-drop operations using the mouse directly on the time cells.

### Extract and add schedule class units

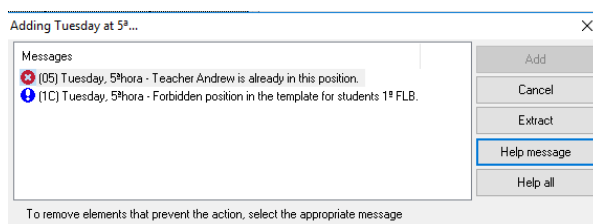


They allow exchanging elements between the result and the list of elements without placing.



To extract elements, select a cell on any table and use the menu command extract from the schedule.

To add class units to the schedule you must first select the cell with the mouse and use the "add to schedule" command. The destination cell defines the day and time in which you want to enter the indicated teaching period from the list of unattached class units. The classroom is automatically assigned to the added teaching period. You can then use the command to change the classroom if necessary.



As a result of the command to add class units, it is possible that some messages appear indicating a cause that prevents the operation; for example, if a teacher already occupies the same position.

These messages can be warnings of caution indicating that although it is possible to fit the teaching period, it would not be done without skipping some restriction initially configured. For example, if the position in the template for students is forbidden.

### Command modify class units

You can change some attributes of class units, complementary activities, on-call services and meetings. For example, the teacher assigned to the class units, add a teacher to a duty, etc.

In case of class units, the modified attribute will be changed in all the class units of the subject. The class units affected by the change will be highlighted in a highlighted color.



You can extract some or all of the class units of the course from the schedule, and create the new class units you need. This is useful because some conditions such as the temporal distribution cannot be modified.



If some class units are configured as simultaneous, you can unlink them through this command.

### Command 'change or add name'



To change the identification, the external key, etc. or add new elements to the list of teachers, subjects, etc. select the command 'change name' or 'add element' in the edit menu.



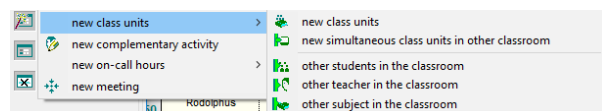
From the **XRHO** documents, the schedules are exportable to other applications, expressing them through their external keys.

### Command 'create elements'

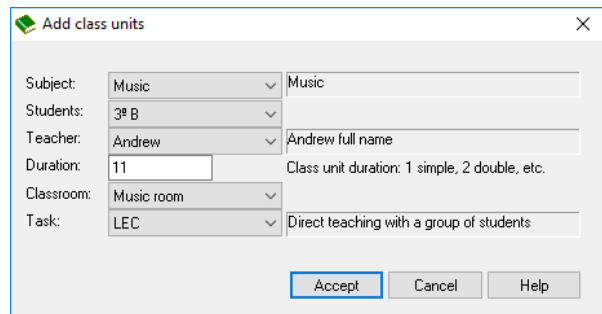
To add new elements to the schedule they must first be created in the list of elements without placing. Then from this list you can enter them in the schedule.



Nuevas



- New class units: it involves a subject, a teacher, a group of students and a classroom. The duration of the class units must be the same for all, for example, 11 will be two new simple class units.
- New complementary activity. I.e. a task assigned to a teacher.
- New on-call hours:
  - New service.
  - New duty assigned to a teacher and framed in a service.
- New teachers meeting. It will ask for a name of the new meeting. Then you can add teachers to the meeting.



### Adjust the classrooms manually

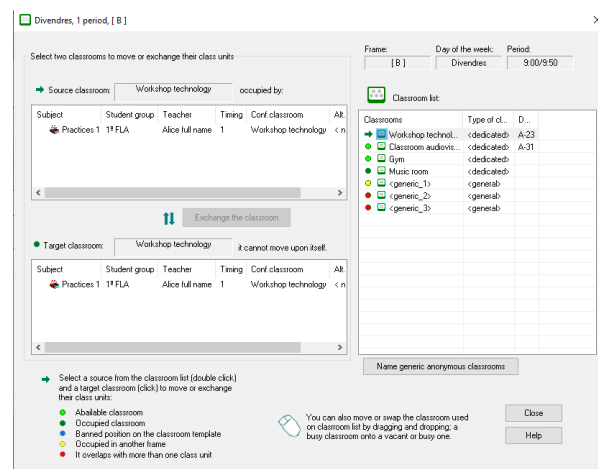


You can change the assigned classroom in a certain period of the schedule. The dialogue window on which to make classroom changes is always referred to a certain position of the table; one hour, one day of the week.

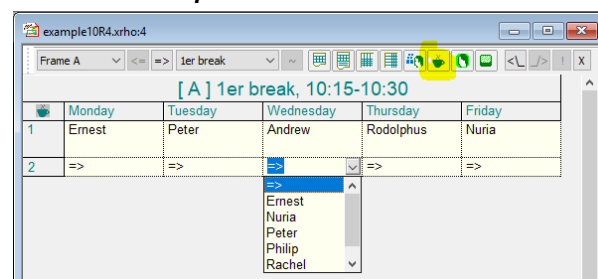
There are two methods to operate on the classroom changes window:

- Choose the teaching period in the original classroom. Choose the free or occupied destination classroom and use the change button.
- Directly by drag and drop with the mouse on the list of classrooms.

From this dialog box you can also name the generic unnamed classrooms (which were not listed). To name them you must do it in the order they are in this list of classrooms, like 'Generic\_#'.



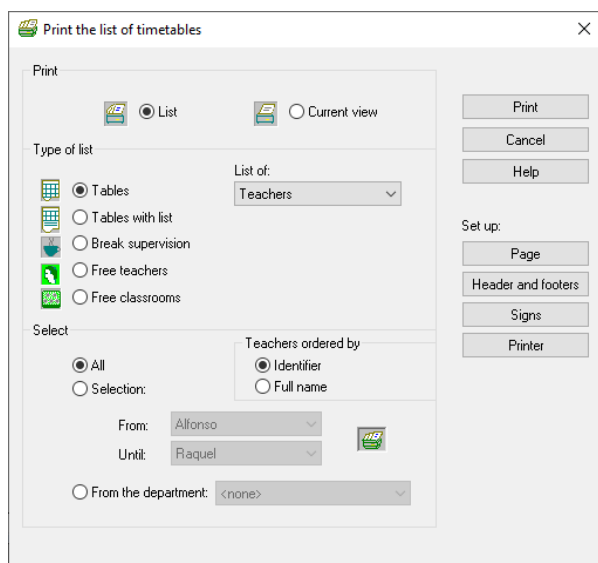
### Insert breaks supervision



You can easily modify or assign the break duties to the teachers on the schedule.

## Lists printing

You can adjust the size of the columns, the font, etc. Use the preliminary print to view before printing. Each table is printed on one or more pages.



To print, the format of the currently active table in the view is used, even for printing the list.

## Export of results



The transfer of results is offered to different academic management platforms: see at the beginning of this guide, import of keys.

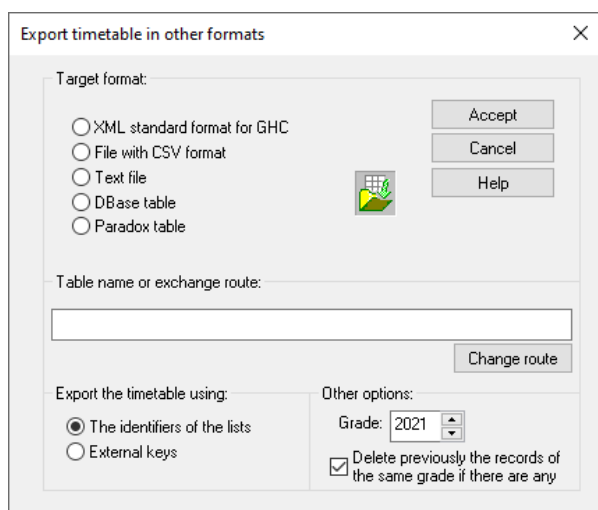


Before proceeding to transfer the schedule, you will be asked to give the keys for the periods of the schedule, etc.

Remember that external keys are used to identify groups, teachers, etc. In the case of not having correctly assigned a key, you can correct it on the result. You can also import all the external keys on drop-down lists from the import data.



Using the 'Edit / Rename' command you can import the external keys of teachers, groups, subjects, etc. And in this way you can assign them one by one, from a drop-down list.



## Change to other formats



**GRI Extension:** Independent document extracted by the editor from a view of the full schedule. The text of these documents can be freely modified from the editor regardless of the full schedule.



**HTML extension:** Allows to save individual tables, or the full schedule, in documents through the Internet.



**XLS Extension:** You can save each individual table as an Excel document (Microsoft Office)



**PDF Extension:** You can save the tables separately or all together in a single document.



The PDF documents present the duration of the periods proportionally. That's the reason why they are very appropriate to present the schedules if there are different schedules for each day, or several frames with overlapping periods.

## The XML-GHC exchange format



The standard interface for the exchange of data and schedules can be used both from the schedule planner and from the schedule editor, allowing the exchange of configuration data and schedules. This format allows access to all the information elements that GHC uses.



Their specifications are available, together with the necessary documentation for them to implement (URL information) all those applications that want to adopt it.





## Answers to some frequently asked questions

### How to set the time frame

- **Number of weeks with different Schedule.** See appendix on this guide: *More than a week*.
- **Overlapping schedules.** Up to four overlapping time frames can be defined. Each group of students will be associated to one of these frameworks. This option would be necessary only if some period of one of the time frames covers two periods in other time frame.
- **There are days of the week with different schedule.** This option requires defining a schedule for each day of the week and it is preferable to use a common time frame for every day whenever possible. If you define different schedules for each day of the week, the templates will be displayed by aligning the first hour of every day. The schedules on the schedule editor can be displayed indicating the times of entry and exit in each cell.



*It is preferable to avoid as much as possible the use of several different time frames. The best would be to establish a single common time frame for all the days.*

To configure a single common time frame you can prohibit certain positions of the schedule, either directly in the general time frame, or in the templates of each of the groups of students.

- **Periods with fractional duration.** This option can be useful in teaching institutions of primary education. It allows the user establish periods with a fractional duration typifying the duration of each section of the schedule, which will be 1, 3/4 or 1/2 period. If you do not use this option, all the periods will have the same duration.



*In any case, even if you do not use the "periods with fractional duration" option, you can configure class units with a simple, double, triple, etc. duration, so that they would cover one, two, or more contiguous periods of the schedule.*

- **Six school days per week.** It allows to define weeks with 6 working days in which to fit the schedules.

### How to condition the classrooms

Assigning a fixed classroom for each of the class units can force an organizational effort that unnecessarily hinders the obtaining of results. For this reason, it is not always necessary to register all the classrooms, but it is sufficient to take into account the total number of teaching spaces and some specific classrooms.

Total number of classrooms that are available:

It is necessary to name the classrooms when they are going to be used for one specific purpose, and when they are going to be shared by several groups of students, for example, gyms, laboratories, etc.

Classrooms	Ab...	Description	Maxi...	Type of Cla...	class...	E..
A-23	A-23	Workshop technology		<dedicated>	34	
A-31	A-31	Classroom audiovisual media		<dedicated>	2	
Gym				<dedicated>	4	
Music room				<dedicated>	4	

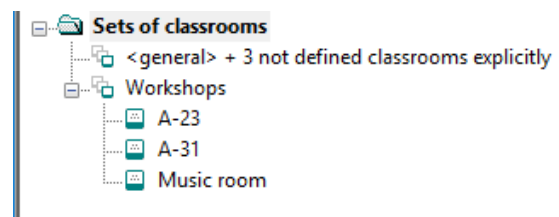
Those that are not important for the process of creating the schedules; group classrooms, for example, can be omitted. The unnamed classrooms are considered **<general>** type.

I.e. if there are enough classrooms to fit all the subjects or if there are assigned classrooms for each group, then you can use classrooms of **<general>** type and offer them to fit most of the class units indicating:

Subject	Students	Teacher	Timing	Classroom	Set of classrooms	N.	D.
Tutorial	3º B	Philip	1	<any>	<general>		

Classroom **<any>** of type **<general>**.

In the case of using subject classrooms, declare the classrooms in the list and group them by subject. You can select a preferential classroom for the class units and choose alternative ones. Keep in mind that you can group the same classroom in several sets.



*To give greater flexibility, you can offer a wide set of alternative classrooms for the class units, even if they require a preferred classroom. The engine will search the preferred classroom according to the weight of this constraint with respect to the other constraints of the schedule.*



*You can always change the classroom from the schedule editor by assigning another that is free, and even name the anonymous classrooms.*

### Only one teaching period of a course is split

If any of the class units of a course is split, for example, to a laboratory, there are two ways to configure it.

- **Using incompatible in the same day:** In this case you can configure if any of the class units has the support of another teacher in the same or in a different classroom.
  - Enter 11 on one line and 1 on another line of the class units list with your support.
  - Make them incompatible with each other on the same day.

Subject	Students	Teacher	Timing	Classroom	Set of classrooms	N.	Different days
Spanish	3º A	Alice	11	<any>	<general>	1	
Spanish	3º A	Alice	1	<any>	<general>	1	
Spanish	3º A	Andrew	1	<any>	<general>		1

In the previous example, one of the 3 class units of Spanish is supported by another teacher in the same classroom, but in

the same way, it could be configured as simultaneous in another classroom.

- **Using sets of electives:** Set the class units independently in the list of class units, grouping them later in a set of electives. See the images:

Spanish-con <3º A-1>	3º A	Andrew	1	<any>	<general>
Spanish <3º A-1>	3º A	Alice	111	<any>	<general>

Group of elective subjects					
3º A-1	- group of students: 3º A - members: 2 - max. overlapping: 2				
Spanish	- Weekly intervals: 3				
Spanish-con	- Weekly intervals: 1				

### Some of the class units of a course are in a different classroom

If any of the class units of a subject has a different condition. For example, if only one of the class units is in a different classroom.

- Enter the class units in different lines of the list of class units.
- Make them incompatible the same day.

Subject	Students	Teacher	Timing	Classroom	Set of classrooms	N.	Different days
Spanish	3º A	Alice	11	<any>	<general>		
Spanish	3º A	Alice	1	A-31	<no>		

In the previous example there are 3 Spanish class units, two are configured in a generic classroom and another in the audiovisual media classroom.

**i** Each time new class units of a certain subject are introduced for the same group, the program warns of this, giving the option to make a condition that puts them on different days.

**?** If the condition is that only one of the class units of the subject is split, see the previous point above in this guide.

### Groups with special needs students

Students with special needs only have some common subjects with their reference group. The rest is taught separately, and, sometimes, with students included in other reference groups. The best way to set this up is by creating groups in which the special needs students are distributed. I.e. registering new groups of students for each of the fractions of special needs students. In this way you can enter your subjects together with those of your reference group when they are common, or detached from it when necessary.

**i** The schedules of the different groups will necessarily fit into the same time frame.

**i** To correctly export the schedule to your management application, you can assign the same external key to the new diversification groups as the one that has the corresponding reference group.

If the students with special needs were divided into two reference groups, two new groups of students would have to be created. I.e. a new group will be created for each fraction of special needs students in each reference group. For example, if both the groups 3º-A, and 3º-B had special needs students, it would be necessary to register the new groups 3º-A-DIV, and 3º-B-DIV.

Students	A..	F..	Grade	Tutor	Classr...
3A			3-GRADE	—	—
3A-DIV			3-GRADE	—	—
3B			3-GRADE	—	—
3B-DIV			3-GRADE	—	—

You can configure the class units with the two special needs groups together in the same classroom. The common class units are given to both the special needs groups and their corresponding reference group. The following images show some examples. You can see the subjects for special needs students.

**i** It must be kept in mind that distributing the special needs students in several reference groups can hinder the solutions.

Subject	Students	Teacher	Timing	Classroom	Set of classrooms
Physical Ed.	3B	—	11	<any>	<general>
Physical Ed.	3B-DIV	—	11	<any>	<general>
Physical Ed.	3A	—	11	<any>	<general>
Physical Ed.	3A-DIV	—	11	<any>	<general>

Subject	Students	Teacher	Timing	Classroom	Set of classroom
Practical field	3B-DIV	—	21111	<any>	<general>
Practical field	3A-DIV	—	21111	<any>	<general>
Physical Ed.	3A	—	11	<any>	<general>
Physical Ed.	3A-DIV	—	11	<any>	<general>
Linguistic field	3B-DIV	—	22111	<any>	<general>
Linguistic field	3A-DIV	—	22111	<any>	<general>
French-Div	3A-DIV	—	111	<any>	<general>
French-Div	3B-DIV	—	111	<any>	<general>

Technology	3B	—	11	<any>	<general>
Technology	3A	—	11	<any>	<general>
Classic culture	3B	—	11	<any>	<general>
Classic culture	3A	—	11	<any>	<general>
Spanish	3A	—	111	<any>	<general>
Physical Ed.	3A	—	11	<any>	<general>
Physical Ed.	3A-DIV	—	11	<any>	<general>
Physics and chemistry	3A	—	11	<any>	<general>
Mathematics	3A	—	1111	<any>	<general>
English	3A	—	111	<any>	<general>

### Four month subjects or in alternate weeks

You can always configure two different weeks; however, it could be introduced in one week, preferably in some cases to simplify. This can be done taking into account that the groups that teach a fourth-monthly, or alternate weeks subject, complement with another subject taught by another teacher with which the group of students is exchanged.

Therefore, to make a four-month course, you have to put two simultaneous subjects with one teacher per course. These two subjects have to be with different groups. Do it as if they were to be this way all year. Then, the first semester a teacher can be with one group and the next with the other, and vice versa. In the results it will not appear as a semester course, but as if the two subjects are given simultaneous, the exchange of the two professors between the two groups can be carried out when necessary.

**i** This solution has the advantage that the teachers will have the same schedule throughout the year.

### Assistance to retake subjects

If it is the case of students who have to retake subjects from the previous grade, and also have to attend to that course with the students that are one grade younger.

This problem is solved by making the class units of the corresponding subjects simultaneous in the two grades. For example, making English subjects simultaneous in one group of 1<sup>st</sup> grade and another group of 2<sup>nd</sup> grade of high school. Instead of English, it can be Mathematics, or any other subject. They are forced to be simultaneous in the schedule only if there are any students who have to retake that subject. For example, if there are students who have to retake English of 1<sup>st</sup> grade, then English of 1<sup>st</sup> grade would have to be simultaneous with English of 2<sup>nd</sup> grade.

There may be some difficulties:

- The requirement of the subjects being held in several groups simultaneously force that these subjects are taught by different teachers.
- It is also necessary to take into account that imposing many simultaneous class units will hinder the obtention of results.

### Fit tutorial hours

The option of the menu of the groups of students "add tutorials" adds tutorials to the list of class units.



*This operation will use some of the subjects defined as tutorials in the list of subjects. Then you can assign them to the group of students, with its tutor.*

To establish the hours in which you want the tutorials to be held, you can use the templates of the tutorial subjects.

### Tutorials in primary education

For primary education, assigning a tutor to a group of students makes it possible to add all the necessary class units to complete the total number of class units of the group of students. You have to assign only the class units that the tutor of the group does not teach.



*If you use this option, you will only have to configure the class units with a specialist teacher for each group of students.*

### Groups of students in remote teaching spaces



If there are groups of students in teaching spaces that are far from the others, you may need to consider the time necessary for teachers to move to these remote teaching spaces. For this reason, the class units that a certain teacher gives in distant places cannot be given in consecutive hours. This condition can be fixed in the schedule planner.

To uphold all these conditions, you can define a list of groups of students whose class units are given in distant places. With this list, the program can establish the conditions between class units that can not be taught in consecutive hours. Then, these conditions will be automatically upheld.



*All the necessary conditions will be established on the class units of the teachers who have part of their schedule with remote groups. The objective is that the class units can not be consecutive if they require a long displacement.*



*From the same window you can also indicate that teachers should not move twice to remote teaching spaces in the same day. This condition will have a weight.*

### Set a total weekly duration with fractional periods

When configuring the weekly distribution of class units of the subjects, the usage of periods of fractional duration can offer great flexibility. The idea is to allow the class units to be distributed as the user wants as long as the total weekly duration with daily maximum and minimum is satisfied. For example, to fit a total weekly duration of 3 periods, the following sets could be used indistinctly: 111,  $\frac{3}{4}\frac{3}{4}\frac{3}{4}$ ,  $\frac{3}{2}$   $\frac{3}{2}$ ,  $\frac{3}{2}$   $\frac{3}{2}$   $\frac{3}{4}$ ..

To do this, express an initial weekly distribution in the list of class units. This first distribution will determine the weekly duration. Then, by turning on the option "allow other distributions", you can switch to other weekly distributions of class units as long as you keep the total weekly duration.



*The option "allow other distributions" gives more flexibility for obtaining results than the option "detail other distributions".*

### Configure vocational education

One of the problems to make schedules in vocational education programs is that there can be a lot of teaching hours per week in each subject. This entails that using rigid weekly distributions (for example 333, 442, etc.) can be very restrictive, hindering the obtaining of results. This is why in these cases it is useful to set up flexible weekly distributions. This flexibility lets you set a maximum number of daily hours, setting a maximum and a minimum number that may reach up to 7, with the possibility of penalizing these limits. Optionally, discontinuous blocks are also allowed.

### Set the minimum / maximum number of daily teaching periods

You can configure strictly both the minimum and the maximum number of teaching periods for each teacher (see teacher properties). You can impose these conditions strictly or you can give more flexibility using the corresponding weight criterion. The program will try, in any case, to balance the daily teaching load of each teacher.

Only full results are optimized, so if you generate a full result, and it is not balanced properly, it may be because the obtention of the final schedule was very forced. You should try to give more mobility, for example, by removing prohibitions that are not justified (by changing them for non-preferred positions, i.e. soft constraints), or by reviewing other strict conditions that hinder the solutions, preventing minimal mobility.

The optimizing process must balance the schedules covering the minimum number of daily teaching periods. If the program cannot do it, it's because there are no combinations. For example, if a certain day a teacher is banned from almost all the positions or the schedule is too complicated to fit, then you should leave the engine working long enough to find a result that meets all these conditions as much as possible



*Use flexible conditions whenever possible, and weigh the optimization criteria to find the best results.*

### No results found

Use the data validation process to look for warnings or errors in the configuration. If the validation process does not find any warnings or errors, but still the engine does not find a result, then it is simply impossible for some reason that it is necessary to analyze manually. Frequently the origin of the problem can be found by running repeated tests, which can help to find what is hindering the obtention of results. You can consult the class units not placed and the rejection statistics. Keep in mind that if solutions exist, the engine finds them fairly quickly.

To try to debug the configuration data you have also the option to attempt to enter, from the schedule editor, the class units that the engine can not fit. I.e. using the editor, try to enter the class units not placed. This way, through the messages that arise, you could find what is hindering the obtention of a full result.

### Recommendations:

- Generate results each time the class units of a new group are introduced.
- First establish the essential conditions, add them when you see that they are possible to put.
- For the class units use, when you can, a set of possible classrooms even if you indicate a preferred classroom.
- Don't use too many prohibitions on the templates or the properties of teachers. Use preferences that will be set along with the rest of the conditions.
- If there are vocational education programs, you can make the weekly distribution of the multiple duration class units of more flexible by using flexible distributions.
- Place the teachers' meetings in such a way that they do not impede the teaching schedule.

### To improve the results

At the beginning, only the conditions necessary for the viability of the schedules must be imposed, leaving flexibility for the program to find complete and optimal results, for which the preferences and the weighted criteria will be used. Only full schedules are optimized.

- To improve the result once full schedules are generated you can adjust the weighted criteria, also reviewing the preferences and the rest of the non-strict conditions.
- Imposing an excessive number of strict conditions such as prohibitions on teachers' templates can hinder the obtaining of results and also its optimization. I.e. if the results are excessively forced, there may be a loss of efficiency in the search for optimization.
- The schedules that are easily found, (without the need for many iterations), will be easier to optimize. If the engine needs to do much iteration to fit full results, it will probably be more difficult to optimize.
- To optimize a result it is convenient to generate complete results with ease, optimizing at least 10 or 20 complete results. The best of them will remain.

### Note also that:

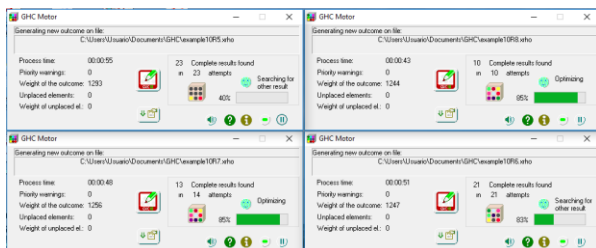
- Do not fix a classroom for a specific course or group of students unless it is necessary. Use a preferred classroom and alternative classrooms.
- It may be convenient, in complicated schedules, to leave as many free positions as possible to groups of students. The remaining periods will be placed in the non-preferred positions that are indicated at the ends of their schedules. In this case you should pay attention to verify that the optimization process is able to eliminate the unoccupied periods of the groups of students' schedules. This circumstance can be configured as priority warning.
- You can offer alternative distributions in vocational education, for example 222 or 2211.
- Express preference instead of prohibitions to address teacher requests.
- You can leave more periods to cover in the duty hours than strictly necessary for the assigned duty hours, the program will ensure that all positions are covered.



*The results that are created easily are also easier to optimize. If the engine needs to do many retries until it finds a complete result, it probably will not be possible to do the changes that would be desirable for its optimization.*

## Working with several results

Each time you run the schedule engine, it keeps only the best of all the results it finds. If you want to obtain several results, or to take advantage of the power of multicore processors, you can simultaneously run the engine several times. If you have a processor with several cores, you can run multiple engine instances at once without this having an impact on the speed of each of them, as long as you don't open more engines than the number of cores in your processor.



## Modifying results

Before retouching the result, make sure that you have obtained complete and optimal results from the configuration data. In any case, from the editor you can modify the schedule keeping its structure and validity, for example, move or add class units, change the rooms, etc.



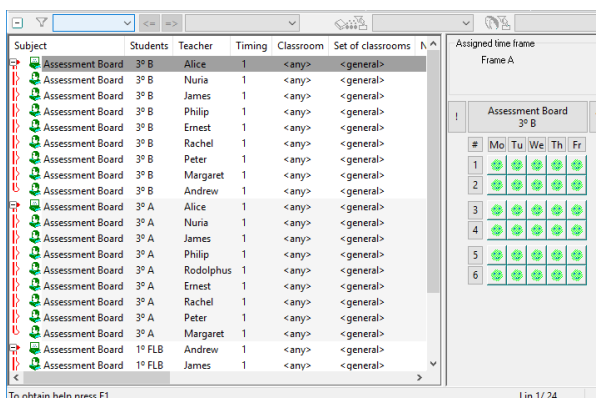
It is advisable to take full advantage of GHC to obtain optimal schedules effectively using the schedule engine.

In the case that the resulted schedules are already delivered and there is an unforeseen event that needs to be taken into account, there is the option to load a result on the schedule planner. This mechanism is simply to read a result file (XRHO extension) from the planner.

## Planning the assessment board meetings

Although GHC is used to fit the teaching hours, you can also use it to organize assessment board meetings.

Use the menu option 'File / Plan assessment board meetings' to automatically generate a GHC configuration file that allows you to plan this meetings. This way, using the schedule engine will avoid the coincidence of teachers in different assessment board meetings at the same time.



In case you want to obtain the file to plan the assessment board meetings from a result, you can load the result from the schedule planner. Once you have the result loaded on the schedule planner, you can use the command 'File / Plan assessment board meetings' to generate the file that allows you to plan the meetings.



## Appendix 1: Primary education



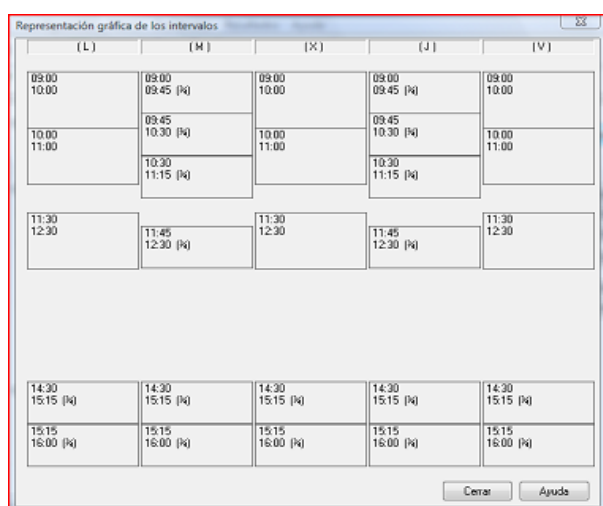
In primary education institutions, particular characteristics can appear for the preparation of their schedules.

**Periods with a fractional duration:** It is necessary to define the periods with a fractional duration. The program allows defining periods of  $\frac{3}{4}$  or  $\frac{1}{2}$  of the length of an period within each time frame.

**Class units with fractional duration:** Whenever periods of fractional duration are defined, it is necessary to define teaching class units with a fractional duration as well. The program allows you to define traching periods of duration;  $\frac{1}{2}$ ,  $\frac{3}{4}$ , and 1.5 ( $1 + \frac{1}{2}$  or  $\frac{3}{4} + \frac{3}{4}$ ). Of course you can also define class units of an integer duration; 1, 2, 3, etc.

**Weekly distributions of a course:** There is the possibility of allowing any combination of class units that meet a certain weekly duration. I.e. for a given weekly duration, together with other conditions, the program will distribute the class units throughout the week. The program will do so in a flexible way, being able to use class units of different duration to fit it and make it optimal.

**Different schedules each day:** It may be useful to combine the two possibilities; periods with a fractional duration and different schedules each day.



Configure the class units with the tutor: For primary education, it is useful to automatically assign the class units to the tutor of the group of students. By adding a tutor to a group of students, you can choose to automatically add to the group all the class units that are necessary until completing the total number of weekly class units. This operation saves time because you will avoid the work of configuring the tutor's teaching units.



*This operation is available from the list of groups of students, using the command: add class units with tutor.*

## Appendix 2: Higher education

### Subgroups



Subgroups contain students belonging to one or more academic groups and are used to exchange resolved data and schedules with certain academic management applications that require them.

### Sets of electives

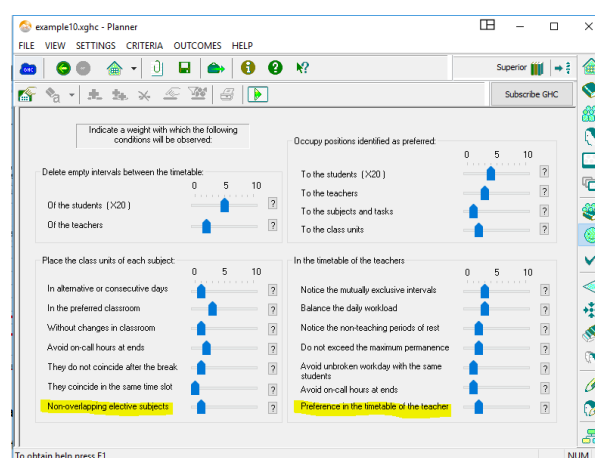


This program offers a specific profile for universities. It is oriented to the university environment, allowing establishing specific conditions to generate schedules in faculties and university schools.

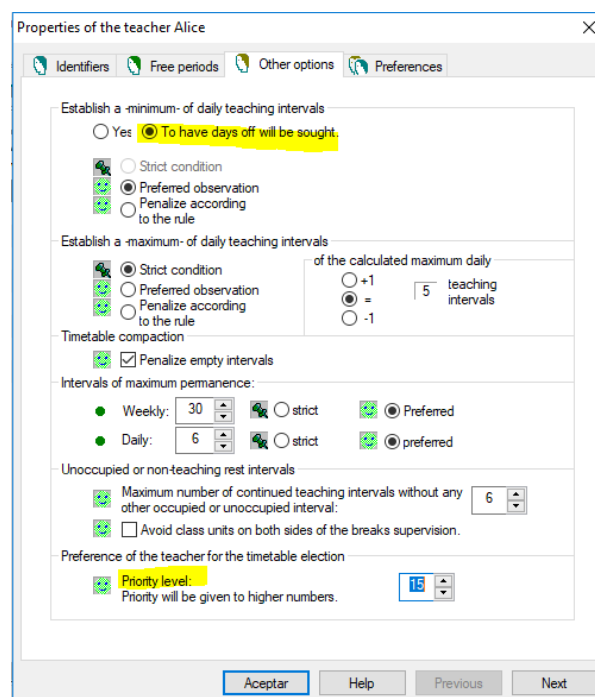


In the higher education institutions, some optimization criteria are different from secondary education centers.

- Establishing a priority in the **choice** of schedules.
- **Minimizing the number of busy days** for teachers .
- Placing the class units of each course on **consecutive days**.
- Placing the class units in the same time in different days.



These criteria will be applied when optimizing the schedule, so it is necessary to first generate full schedules so that engine starts optimizing them.



### Elective sets of subjects

The sets of electives are useful to configure the optional subjects in the university environment. The elective sets contain subjects from the same group of students that may overlap each other, indicating which electives may overlap each other, but giving flexibility so that they can be placed over the entire time frame.

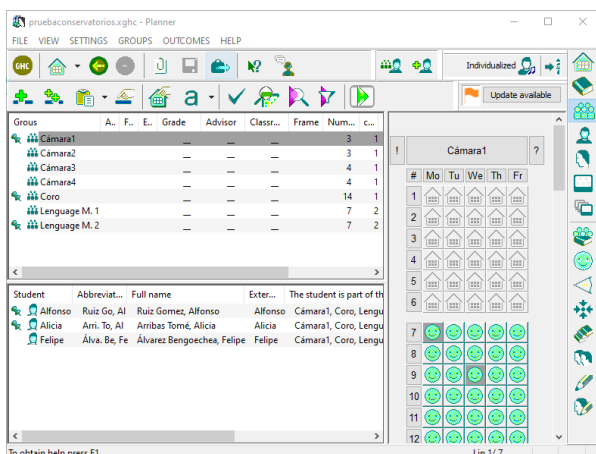


*It can be said that, in general, it is advantageous to set up optional subjects when it is not necessary to determine exactly how all the subjects of the set will overlap one another. In another case, simultaneous sessions could be defined directly in the list of class sessions.*

## Appendix 3: Conservatories of music and individualized teaching

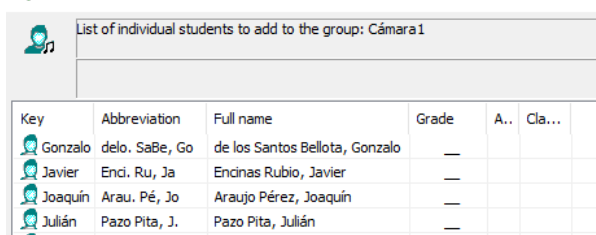


The selection of this application profile adds to the list of groups, a list of individual students. These students may be part of one or more student groups. Both individual students and groups of students are associated with a teacher, a classroom, etc. in each subject.



You can easily add new students and associate them to groups using the corresponding commands.

Select one or more items from the list.



*The engine will optimize the students' schedule according to the preferences of each one of them and avoiding unoccupied intervals in their schedules..*

## Appendix 4: Groups assistant



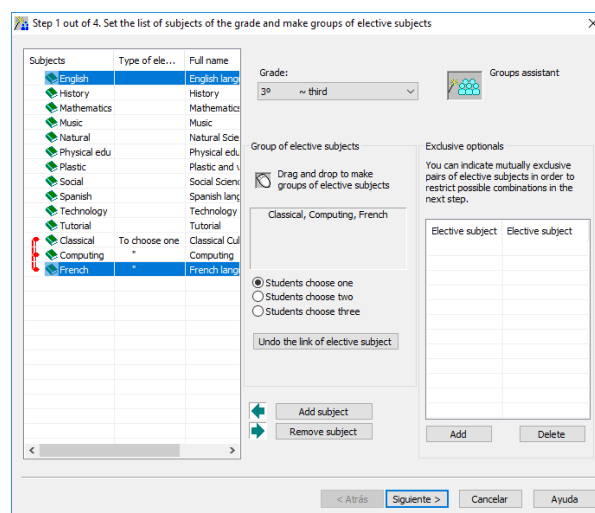
It has an optional assistant that can help you organize the groups in which the students are distributed. It is necessary to define the elective subjects that are offered in the grade, how they are chosen, and the number of students enrolled in each of them.



*The use of this assistant is not mandatory, but it can be useful in some cases. The group assistant can help you organize the elective subjects that will be taught in each grade of the groups of students.*

The data that the assistant needs is:

- The subjects taught in each grade.
- The number of students enrolled in each elective course.



### Features of the group assistant:

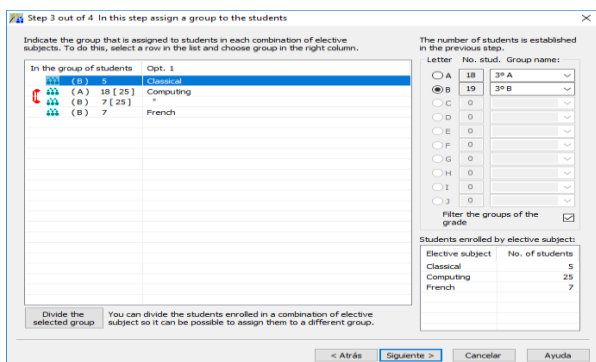
- Subjects that are configured in the list of subjects will be associated with the grade. If they were not, it is possible to add them manually.
- You should create sets with the elective subjects. If students have to choose more than one, indicate how many should be chosen.
- This assistant generates the class units of each of the groups of students, both common and electives.
- Once the assistant has finished, you can assign the teaching staff already on the generated class units.

### Organize the groups of students in 4 steps:


1. Configure the subjects, grouping the elective ones and leaving the common ones alone. It is allowed to configure sets in which students must choose more than one option.




*You can limit the combinations of electives that are generated. You can point out pairs of incompatible subjects. For example, you can indicate that the students who choose French as their first language can not take French as an elective course.*




2. All possible combinations of elective subjects are presented. You must enter the number of students enrolled in each of them, and the number of groups in which they will be distributed.

 You can click with the mouse on the headers to sort the combinations of subjects.

3. The assistant will ask you to associate each combination of subjects with a group of students.

 You can also split up a group of students enrolled in a certain combination of elective subjects into several smaller groups.

4. Finally, you can put in the same classroom the smaller groups that arise from the split of the electives.

 In case of offering sets of electives subjects in such a way that the students can choose two or more, there could be error messages indicating that a certain elective can not be taught to all students at the same time, i.e. it would be impossible to group together fractions of students with the same elective course.

## Appendix 5: File platform



This will help you manage application files, share them through the Web, and configure teacher assignments and preferences.

From the file platform you can:

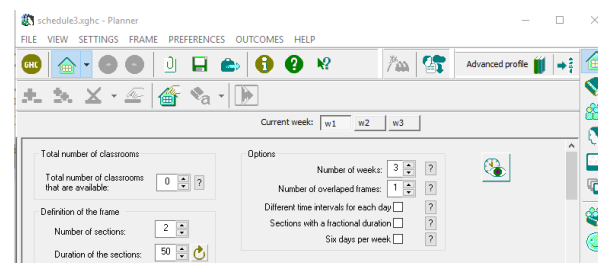
- Search files in your computer and in GHC Web
  - Configuration files (.xghc and .ghc)
  - Resulted schedule (.xrho and .rho)
  - Independent schedules (.gri)
- Handle the found files.
  - Choosing the resulted schedule obtained from a specific configuration file.
  - Delete files. Copy and paste files. Drag and drop, etc.
  - Using the rest of the processes that GHC performs.
- Have shared file folders.
  - Access shared file folders, from different devices, favoring group work.
  - Merge configuration files prepared separately.
  - Collect teacher assignments and preferences:
    - See the selection of all teacher preferences from each department.

## Appendix 6: More than a week

Use for several weeks only if really needed. It is preferable to use a single week to simplify the configuration. If the schedules of the different weeks are only slightly different, you can probably configure the differences by adding all the class units on a single week.



See four-month subject or alternate weeks in the answers section to some frequently asked questions in this manual.



- Normally, schedules are one week, and it is repeated throughout the course. Set up more than one week allows you to generate different schedules for each week.
- The different weeks will share a common time frame, although they will have their own templates. That is, an item could have a prohibited position only in a certain week.
- The class units, meetings, etc. will be defined to fit in a certain week or in several of them.
- This option can be useful, for example, to use different schedules in alternate weeks, to prepare the four-month schedules, or to plan a course of up to six weeks with different contents for each week.



Same or different position in the schedule of the elements assigned over several weeks: You can establish if you want the class units, meetings, activities, etc. configured over several weeks, keep, or not, the same position in the schedule.

