COURSEDOG
Section Optimizer Training Deck

Optimizing for Rooms

Table of Contents

Section Optimization Overview

Section Optimizer Goals

PRIMARY GOAL
To help schools best utilize their space

Data driven, programmatic decisions to improve institutional and student success metrics.
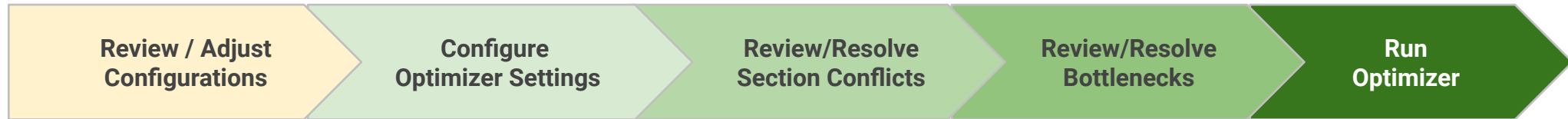
SECONDARY GOAL
To save admins time

Save time to re-allocate to other strategic initiatives that improve institutional and student success.

The time-savings benefit may not be immediately impactful the first term you utilize the optimizer as you must learn the settings, inputs, and process that work to give you the best results – but you will get there!
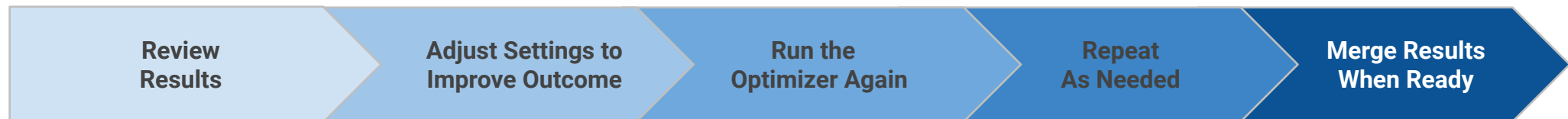
Section Optimizer Process Overview

Ensuring a **successful optimizer run** involves a few different steps:

Review / Adjust Configurations	Configure Optimizer Settings	Review/Resolve Section Conflicts	Review/Resolve Bottlenecks	Run Optimizer

Before you merge results, you might want to play around with settings and **run again** until you **get results that best meet your needs**:

Review Results	Adjust Settings to Improve Outcome	Run the Optimizer Again	Repeat As Needed	Merge Results When Ready

Considerations & Recommendations

Optimizer Considerations & Recommendations

- To get the best results requires a **deeper configuration**/settings effort (than is required for use of the rest of the Scheduling platform).
  - Coursedog recommends the optimizer **be managed by a trained and centralized resource** versus decentralized resources managing outputs in silos.

- **Give yourself 3+ weeks to test the optimizer** settings and inputs and review several runs before your school needs finalized results. Testing will include:
  - Data cleanup
  - Bottleneck resolution
  - Multiple runs
  - Playing around with settings
  - Making sure all data is "good"
    - Complete preferences
    - Resolve data discrepancies from SIS and in-system settings
    - Filter out online sections

Optimizer Considerations & Recommendations

- The optimizer is highly **customizable**. Settings can be configured to allow different schools to best meet their unique needs.

- The optimizer is highly dependant on the inputs it has: "**Bad data in, bad data out**." i.e. It can't optimize for information and preferences that are not captured in its **reference tables**.

- Note: If you have **both Academic and Events Scheduling** Double-bookings between these two products can happen if you allow classroom spaces to be used for Events. You will have the opportunity to review such conflicts when viewing Optimizer results.

Optimizer Considerations & Recommendations: When to Introduce Into Your Process

Coursedog recommends:

- **Wait to utilize the optimizer** until after you and your end users have completed your initial rollout and adoption of the primary Scheduling platform. i.e after at least one successful semester/term using Academic Scheduling

- Focus of initial Scheduling go-live should be **adoption**; **user comfort**; and a **successful end-user experience**

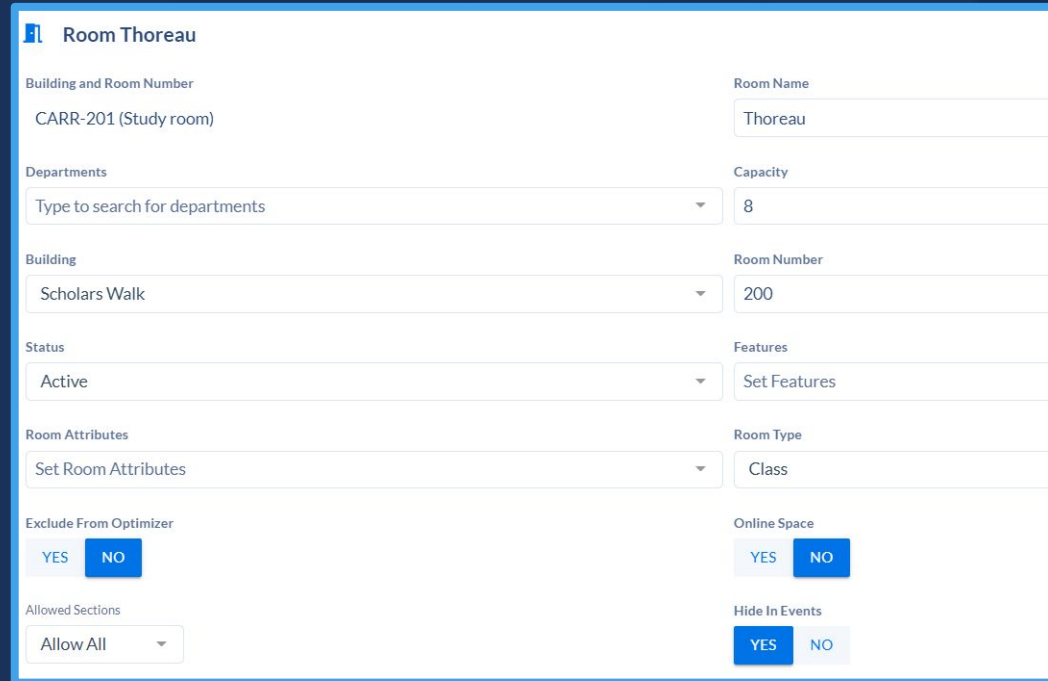# Configuration Requirements

Configuration Requirements

Before you run the room optimizer, make sure the following are thoroughly configured:

1. Room Settings

2. Section Preferences

3. Instructor Preferences (if collected by your institution)

4. Assign Meeting Patterns

Configuration Requirements

Room Settings

- LOCATION: Scheduling > Rooms > [Click on room whose settings you wish to adjust]

- You need to configure all of the below settings.
  - Room Type
  - Capacity
  - Allowed Sections filters (details on next page)
  - Features
  - Online Space
  - Departments

- If you want a room to be excluded from the optimizer, make sure "YES" is selected under "Exclude from Optimizer"

- This information is unlikely to come from the SIS (It can be uploaded en masse via CSV)

Room Thoreau

Building and Room Number
CARR-201 (Study room)

Room Name
Thoreau

Departments
Type to search for departments

Capacity
8

Building
Scholars Walk

Room Number
200

Status
Active

Features
Set Features

Room Attributes
Set Room Attributes

Room Type
Class

Exclude From Optimizer
YES **NO**

Online Space
YES **NO**

Allowed Sections
Allow All

Hide In Events
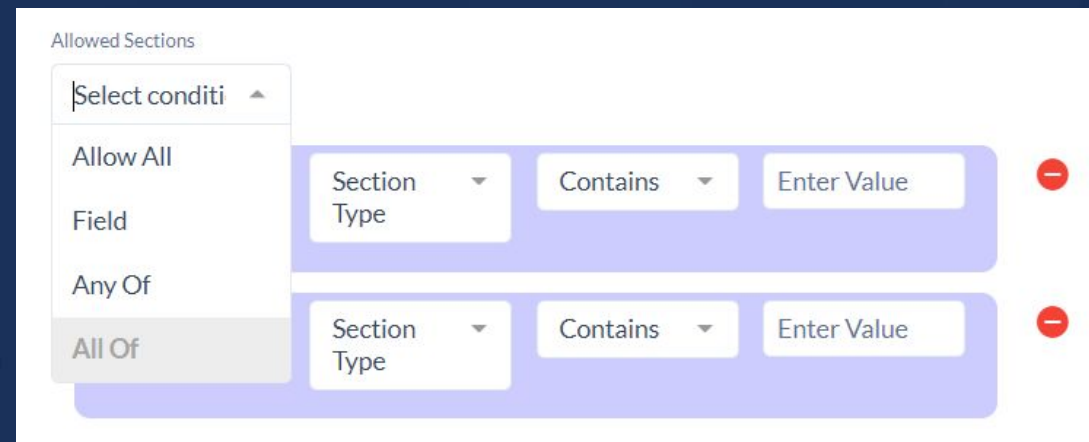**YES** NO

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Configuration Requirements

Room Settings (continued)

Allowed Sections Filters
You can use Allowed Sections filters to define what sections are allowed to be assigned to the room.

Options include:

- *Allow all:* Any section can reserve the room.

- *Field:* Prompts you to add a custom filter to determine which sections can book the room.

- *Any of:* To be used when multiple filters are added and only requires that only one of the filters be satisfied by a section in order for it to be assigned to the room.

- *All of:* Requires all filters be satisfied by a section in order for it to be assigned to the room.


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Configuration Requirements

Section Preferences

- LOCATION: Scheduling > Section Editor

- Data must be filled out for every section
  - To do this, open a section and select the "Section Editor" icon
    - Or download the Course Sections List CSV
  - Important inputs:
    - Meeting patterns
    - Relationships
      - In addition to the Section Editor, relationships can be defined here: Home > Relationships
      - Make sure you have defined a relationship for all cross-listed or linked sections
    - Enrollment capacity
    - Term start and end dates
    - Any other section-specific preferences you'd like to optimize for

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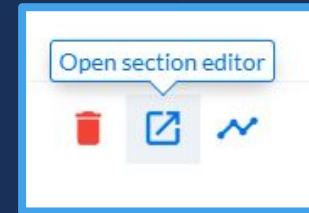
Configuration Requirements

Instructor Preferences

- LOCATION: Scheduling > Section Editor > Instructors > [Select Instructor] > Edit Preferences

- If your institution collects faculty preferences, view individual faculty profiles to make sure those have been captured
  - Gathered via preference forms or managed in instructor profiles

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Configuration Requirements

Assign Meeting Patterns

- In order for the optimizer to be able to assign rooms to sections, those sections need to already have assigned meeting patterns.

- The Room Optimizer assigns rooms on a meeting-by-meeting basis. If some sections have rooms assigned but others do not, the optimizer will only assign rooms to the sections that don't already have room assignments – so long as times have been assigned.

- You can assign meeting patterns at:
Scheduling > Section Editor > (Open Section) >
Meeting Patterns & Rooms Card

🕐 Meeting Patterns & Rooms					
DAYS	START	END	ROOM	START DATE	END DATE
Tu	10:00 AM	11:00 AM	KIN...	01/10/22	05/03/22

+ MEETING PATTERN   🚫   📅 SET DETAILS

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Running the Optimizer

Running the Optimizer - Best Practices

- Run the optimizer for your entire institution, not department by department

- If, however, you optimize in batches, batch by attributes (e.g. large enrollment capacity sections first) that are the priority.
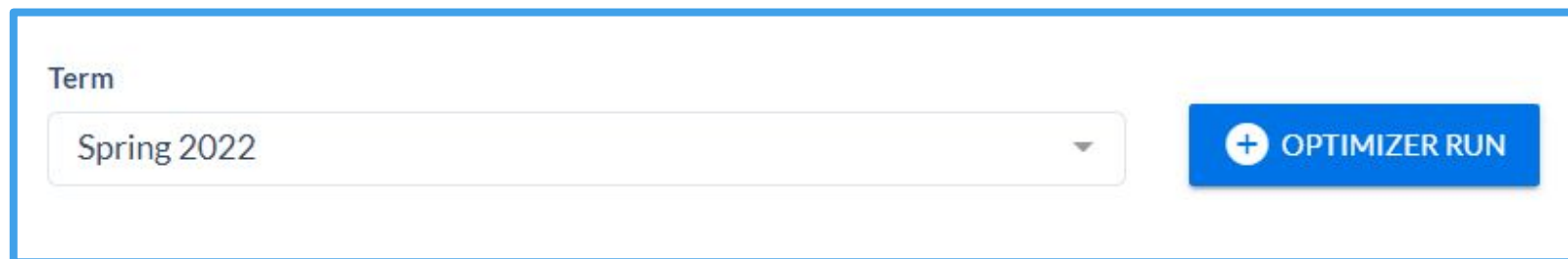
   Example:

   1. Run optimizer for priority 1
   2. Merge results
   3. Run optimizer for priority 2
   4. Merge results
   5. Etc.

Running the Optimizer

LOCATION: Scheduling > Optimizer > Section Optimizer

- Make sure the correct scheduling term is selected
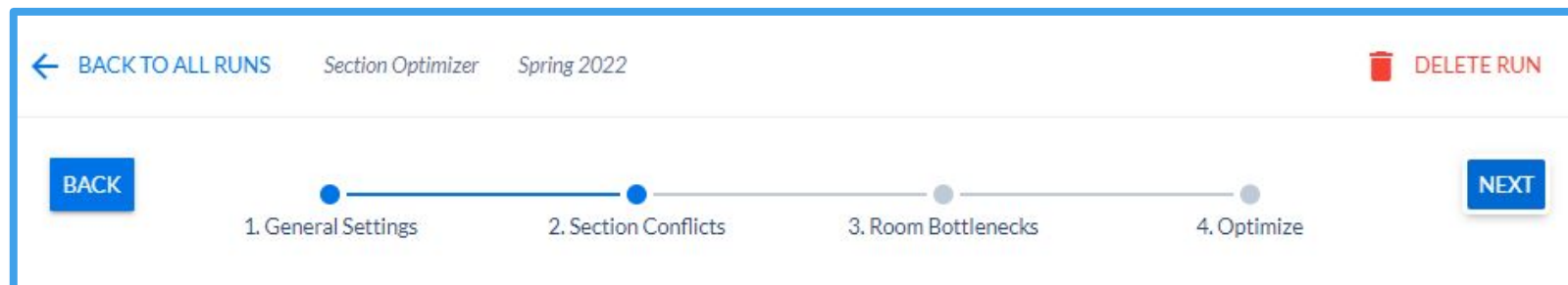
- Click *+Optimizer Run*

Term

Spring 2022 ▾   ⊕ OPTIMIZER RUN

- Progress bar at top will track your status

← BACK TO ALL RUNS   *Section Optimizer*   *Spring 2022*   🗑 DELETE RUN

BACK   ●————————●————————○————————○   NEXT

1. General Settings   2. Section Conflicts   3. Room Bottlenecks   4. Optimize

Running the Optimizer

Different "To Do" checklists will guide you through each section:

1. General Settings / Advanced Settings

To Do

☐ Fill out general information
☐ Fill out Time Scheduling settings if you want the optimizer to assign times
☐ Fill out Room Scheduling settings if you want the optimizer to assign rooms
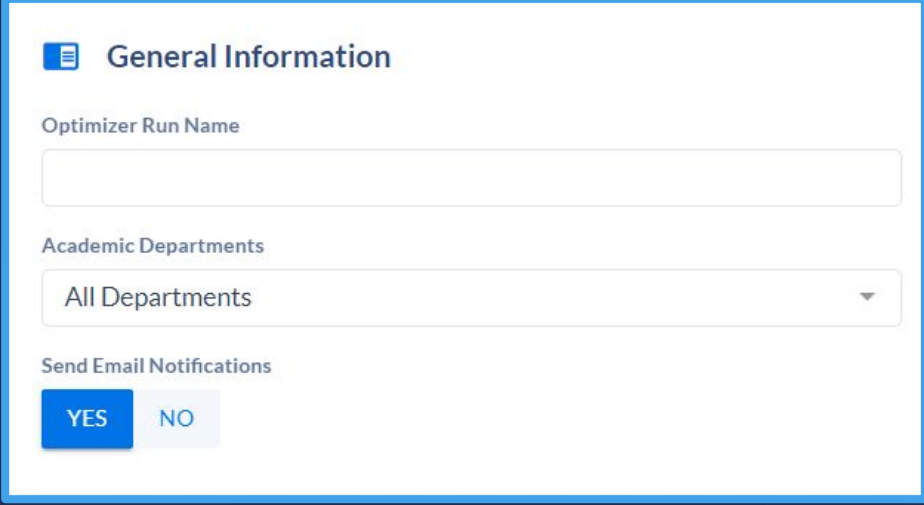
2. Section Conflicts

3. Room Bottlenecks

4. Optimize

Running the Optimizer

SECTION 1: General Settings

General Information

- *Optimizer Run Name*: Make this as specific as possible
  - You might want to run the optimizer multiple times before you merge results

- *Academic Departments*: Select whichever department(s) you wish to optimize for

- *Send Email Notifications*: Select "YES" to receive an email once the optimizer has finished running (it can take anywhere from a few minutes to several hours)

General Information

Optimizer Run Name

Academic Departments

All Departments

Send Email Notifications

YES   NO

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Running the Optimizer

SECTION 1: General Settings

Room Scheduling

- *Assign Rooms:* Select "YES" to have the optimizer assign the best-fit room.

- *Minimum Seat Utilization*: Dictates the largest room that could be assigned to a section
  - E.g. At 50% – the default setting – a room with a capacity of 40 can be assigned to a section with an enrollment capacity of 20+.

Room Scheduling

Assign Rooms
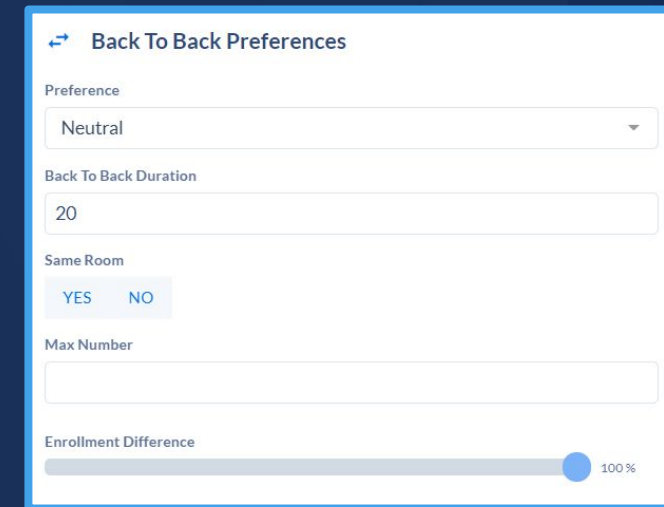
YES   NO

Minimum Seat Utilization

50 %

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Running the Optimizer

SECTION 1: General Settings

Back To Back Preferences

- *Preference*: Determines whether or not the optimizer should mimic instructor profiles
  - "Yes" means the optimizer will change to accommodate back-to-back preferences
  - "No" means the optimizer will not take back-to-back preferences into account
  - "Neutral" means optimizer behavior will not change to accommodate preferences

- *Back To Back Duration*: Determines the maximum passing period between classes

- *Same Room*: Determines if instructors should stay in the same room when teaching back-to-back classes
  - If "Preference" is set to "Yes" or "Neutral," this should be "Yes" as well

- *Max Number*: Determines the maximum number of classes that can be back-to-back

- *Enrollment Difference*: Allows class size to determine back-to-back status
  - Classes aren't considered to be back-to-back if the size is beyond whatever "enrollment difference" is set to be.
  - Default setting is 100%, which means maximum enrollment is not a factor in considering whether or not classes are considered to be be back-to-back.
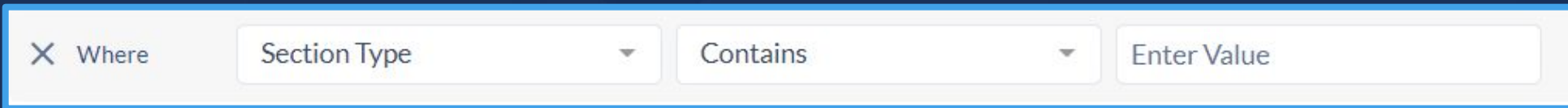
⇄ **Back To Back Preferences**

Preference

Neutral

Back To Back Duration

20

Same Room

YES NO

Max Number

Enrollment Difference

100 %

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Getting Started

SECTION 1: General Settings

Filters

- Select *ADD FIELD* to tell the optimizer which sections and classes should be pulled into the optimizer and which sections it should assign rooms to

- If you don't add any fields/filters, it will optimize for all sections

- Each filter contains three fields:
  1. *Attribute*: This defaults to "Section Type"; use the dropdown menu to find the option that fits your need
  2. *Operator:* This defaults to "Contains"; Use the dropdown menu to find the option that fits your need
  3. *Value*: Manually input the value, if applicable (e.g. Cancelled)

✕ Where	Section Type ▾	Contains ▾	Enter Value

- Here's a common field/filter sample:
  - Where "Section Status" *is not* "Cancelled"

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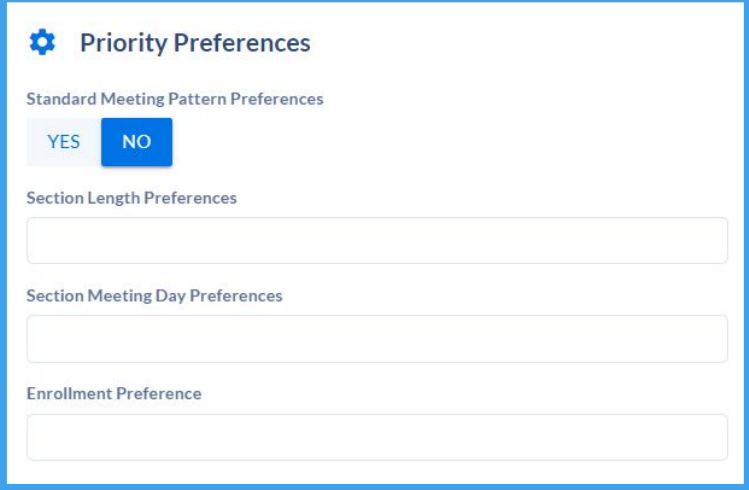
Running the Optimizer

SECTION 1: Advanced Settings

Priority Preferences

- These settings are optional, depending on your needs

- *Standard Meeting Pattern Preferences*
  - "Yes" means the optimizer will prioritize sections that use standard meeting patterns
  - "No" means the optimizer will **not** prioritize sections that use standard meeting patterns

- *Section Length Preferences*: Gives preference to sections are the same duration (or longer) than the value entered here

- *Section Meeting Day Preferences*: Gives preference to sections that meet the same number of days (or more) than the value entered here

- *Enrollment Preference*: Gives preference to sections that have a maximum enrollment that is equal to or greater than the value entered here

⚙ Priority Preferences

Standard Meeting Pattern Preferences

| YES | NO |

Section Length Preferences

Section Meeting Day Preferences

Enrollment Preference

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Running the Optimizer

SECTION 1: Advanced Settings

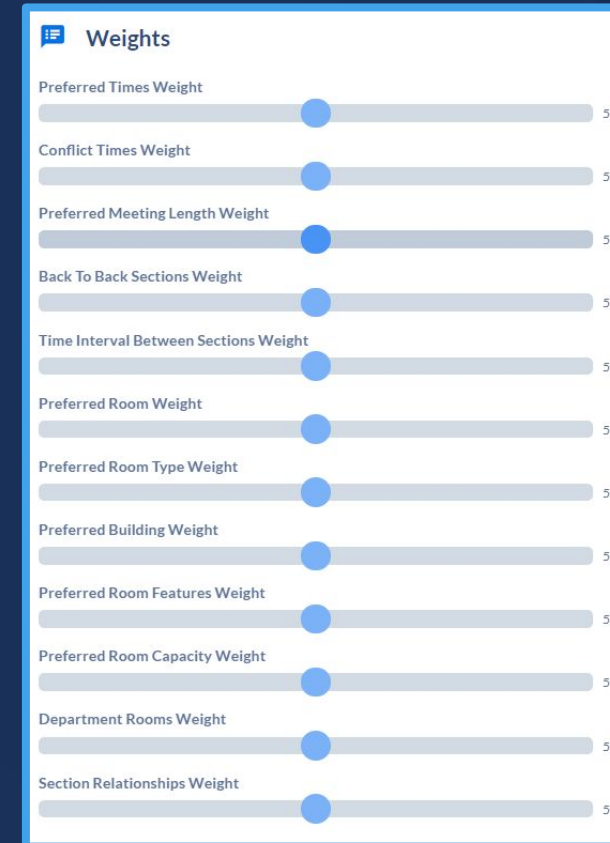## Weights

- A lot of the room preferences found here can also be assigned at the section or instructor level

- You can ignore any weights involving time

- Selected value tells the optimizer how much it should weight each preference
  - 0 = Completely ignore
  - 10 = Hard constraint
    - Avoid setting anything to 10, as this will likely cause the optimizer to fail

Weights

Preferred Times Weight — 5

Conflict Times Weight — 5

Preferred Meeting Length Weight — 5

Back To Back Sections Weight — 5

Time Interval Between Sections Weight — 5

Preferred Room Weight — 5

Preferred Room Type Weight — 5

Preferred Building Weight — 5

Preferred Room Features Weight — 5

Preferred Room Capacity Weight — 5

Department Rooms Weight — 5

Section Relationships Weight — 5

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Running the Optimizer

SECTION 1: Advanced Settings

Weights (Continued)

- *Preferred Times*, Conflict Times*, Preferred Meeting Length*, Back To Back Sections, Time Interval Between Sections*, Preferred Room, Preferred Room Type, Preferred Building, Preferred Room Features, and Preferred Room Capacity*: Weight to prioritize instructor-provided preferences**

- *Department Rooms*: Weight heavier if you have department-owned rooms

- *Section Relationships*: Weight heavier if you have linked sections

*You can ignore these
**If your institution gathers faculty preferences and you want to give those preferences weight, the suggested value is "8"

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All done with settings? Yay!

Hit "NEXT" in the Optimizer

Running the Optimizer

SECTION 2: Section Conflicts

- Screen shows all conflicts that could negatively impact optimizer performance

- Resolve conflicts before running the optimizer (NOTE: The Optimizer can run with conflicts, but unresolved RED conflicts will result in a lack of assignment)

- To resolve conflicts:
  1. Click on the conflict to open the Section Editor

  2. Adjust settings to resolve the conflict
     - *No maximum enrollment capacity*: Input a number
     - *Double-booked rooms*: Change the room assignment or assign the "same room" relationship (if applicable

  3. Save your changes
  4. Refresh the page
  5. Hit "Next"

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Running the Optimizer

SECTION 3: Room Bottlenecks

- Bottlenecks that could negatively impact optimizer performance will be captured here

- Monitor & address bottlenecks before running

- To resolve bottlenecks:
  1. Click on the bottleneck to review

  2. Adjust settings as needed to resolve the bottleneck:
     - Confirm/correct Enrollment Capacity for impacted sections
     - Confirm/correct Room Capacity for involved rooms
     - Change Section Times to a less popular time

  3. Save your changes

  4. Refresh the page

  5. Hit "Next"

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Running the Optimizer

SECTION 4: Optimize

- If your settings are complete and conflicts and bottlenecks are resolved: CONGRATULATIONS! You're ready to optimize.

- Select "CLICK TO OPTIMIZE!"

- You'll see a time estimate at the bottom of the screen. The time defaults to 119 minutes, but the optimizer can take anywhere from just a couple minutes to 24 hours – it all depends on the number of sections & constraints.

- The wheel on the right will show you it's working.

- You don't need to stay in this window; you can exit out of this screen, and the optimizer will keep running.

- If you selected "Yes" to receiving an email notification, we'll let you know once the optimizer has finished

← BACK TO ALL RUNS   Section Optimizer   Spring 2022   🗑 DELETE RUN

BACK

1. General Settings   2. Section Conflicts   3. Room Bottlenecks   4. Optimize   NEXT

Run The Optimizer

Click optimize to create your perfect schedule. Once the optimizer has completed, you will be granted access to the Optimizer Results Dashboard, which contains the newly built schedule along with many pre-built reports.

OPTIMIZING...

1%   ● Optimizing...

Estimated Time Remaining: 119min

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Understanding Your Results

Understanding Your Results

To view results:

- <u>If You Received an Email</u>: Click the link in your email.

- <u>If You Stayed on the Page</u>: Select "Click here to view the optimizer results" and then click into the run.

- <u>If You Left the Page</u>: Log into Coursedog; visit the Section Optimizer; and click into the run.

Understanding Your Results

Results <u>are not</u> **automatically committed to the system:**

- Nothing will be merged until you indicate whether you want the entire run to merge or only specific assignments

- If you aren't satisfied with results, you can adjust settings and run the optimizer again

Understanding Your Results: Optimizer Results Dashboard

Overview 🏠	Results 📋	Conflicts ❗	Export ↑↓	Bottlenecks ⧗	Input Settings ⇥
Shows optimizer-related reports.	Lists all sections provided to the optimizer and indicates whether or not they were scheduled successfully.	Lists all conflicts that exist in the optimizer output. You can filter alphabetically by course code (default) or by conflict type.	Allows you to download CSV reports for course sections, room bottlenecks and optimizer assignments.	Lists all room bottlenecks that exist in the optimizer output.	Allows you to view the settings that were defined before the optimizer run.

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Understanding Your Results: Overview

Overview Tab

The Optimizer Results Dashboard defaults to the results overview

Understanding Your Results: Overview

Overview Tab (continued)

See the following at a glance:

- Number/percent of conflicts

- Average percent usage/seat utilization of rooms

- Seat utilization by hour

- Current trends

- Hourly and daily schedule distribution

Understanding Your Results: Page Setup

Results Tab - Page Setup

- The legend at the top will help you understand which sections:

  Were scheduled successfully | Weren't scheduled

  Were scheduled with issues | Were excluded from the run

- You can add filtering options and change the view

The following are the results from the optimizer run. You can merge all of these results into your existing schedule, or you can merge specific sections.

MERGE ALL RESULTS

Spring 2022 All Departments

☑ ✓ Scheduled Successfully   ☑ ⚠ Scheduled With Issues

☑ ⊖ Not Scheduled   ☐ 🔖 Excluded

≡ FILTER   ▦ CHANGE VIEW   🔍 Search for courses

Viewing 1-25 of 272   ‹ PREVIOUS   NEXT ›

Understanding Your Results: Viewing Results

Results Tab - Viewing Results

- Click into a section to see whether or not a room assignment was made

- You can open the Section Editor to view what was provided to the optimizer, but you cannot make changes from this screen

- If you want to keep results but make changes to the section:

    1. Merge results

    2. Navigate to the Section Editor to make changes
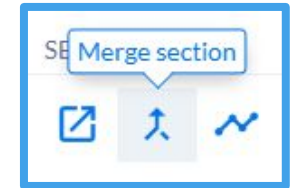

Open section editor
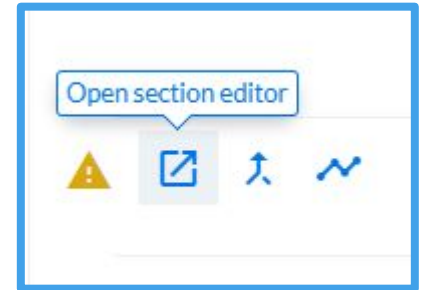
Understanding Your Results: Merging Results

Results Tab - Merging Results

- To merge specific sections

    a. Click into each section

    b. Select "merge section"

- To merge all results, select "merge all results" in the upper right-hand corner of the screen

Understanding Your Results: Conflicts Tab

Conflicts Tab

- The "Conflicts" tab provides an overview of **all** conflicts:

    a. Conflicts that resulted from optimizer assignments **and**

    b. Conflicts for sections that were excluded from the optimizer

- The bar at the top captures key data:

    a. Total conflicts & percent sections with conflicts

    b. Total preference conflicts & percent of preferences satisfied

- You can filter by conflict type via the dropdown

- Click into individual sections to learn more about the conflict

Understanding Your Results: Export Tab

Export Tab enables you to download three reports:

1. Course Sections List

   a. List is identical to what you'd find in the CSV report available under the general reporting tab

   b. It shows you what the schedule would look like if you were to merge results from this optimizer run

2. Room Bottleneck List

3. Optimizer Assignments

NAME	DESCRIPTION	DOWNLOAD
Course Sections List	This report is a CSV file that lists all course sections that were contained within the optimizer run, including time and room assignments made by the optimizer.	DOWNLOAD
Room Bottleneck List	This report is a CSV file that lists all room bottlenecks detected in the optimizer output.	DOWNLOAD
Optimizer Assignments	This report is a CSV file that lists all time and room assignments made by the optimizer.	DOWNLOAD

Understanding Your Results: Bottlenecks Tab

Bottlenecks tab shows an overview of bottlenecks in the system.

- Number of bottlenecks

- Number of sections impacted by bottlenecks

Understanding Your Results: Input Settings Tab

Input Settings Tab

- Shows you how this optimizer run was configured

- If you aren't happy with run results, view settings here to see what you might want to tweak before the next run

- Compare settings/results for each run to determine what works best for your institution

GENERAL SETTINGS   ADVANCED SETTINGS

General Information

Optimizer Run Name
—

Academic Departments
All Departments

Send Email Notifications
Yes

Room Scheduling

Assign Rooms
Yes

Minimum Seat Utilization
50

Frequently Asked Questions

Frequently Asked Questions - *Double-Booked Rooms*

Can you run the optimizer with double-booked rooms?

The optimizer will not double book a room unless you have properly created a linked relationship between the sections in question. If you must run the optimizer with double-booked rooms but cannot create a relationship between the sections first, please contact your Coursedog team before running the optimizer.

Can I set a hard constraint so the Optimizer respects existing section relationships and double books rooms when necessary?

The optimizer treats relationships as a "preference" rather than a hard constraint, in which case the optimizer might still assign linked sections to different rooms. You can change this from a "preference" to a "hard constraint" by increasing the weight under Optimizer > General Settings > Advanced Settings. Keep in mind that hard constraints make the optimizer more likely to fail.

Frequently Asked Questions - *Miscellaneous*

Rule Exceptions

When we create a section rule exception, are those exceptions taken into account for room assignment by the optimizer? For example, if the Double Booked Room rule has an exception for spring break sections, would the optimizer double book spring break sections?

Section rule exceptions are not taken into account by the Optimizer. In this example, the optimizer would still avoid double booking rooms.

Order of Operations

What happens if a user changes the schedule while the optimizer is running?

Their results will stick **<u>unless</u>** you decide to merge the optimizer results back into the schedule. In that case, changes the user made will be overwritten by the optimizer.

Frequently Asked Questions- *Troubleshooting*

What should I do if the optimizer fails to run?

Make sure your schedule has a maximum enrollment set for every section and contains no double-booked rooms. If these two factors are met but the optimizer still fails to run, contact Coursedog by filling out a support ticket.

What does it mean if a section is flagged as "infeasible"?

This means there is no possible solution given the constraints. To resolve, relax as many constraints as possible. Options to consider:

- Lower the weight on any "Advanced Settings" set to 10
- Change maximum enrollment values for sections, if possible
- Change the Minimum Seat Utilization value, if possible
- Run the optimizer in batches, with only a few sections at a time

If all else fails, exclude linked sections from the optimizer run.

Frequently Asked Questions - *Troubleshooting*

In Results, why do some sections show a "Not Scheduled" flag?

"Not scheduled" sections tend have one of the following issues:

- There are no rooms left with a high enough capacity to fit the enrollment capacity of the section
- Room capacity is far greater than the section capacity and violates the seat utilization ratio configured in optimizer settings
- The section has an enrollment capacity of "blank" or "0".

You should assign rooms manually for these sections. Consider changing times if that helps.