

# ARMS

Assumption Rooms Management System

# Our Team



Grid Kornsutatipkul

6013732



Thanathas Chawengvorakul

6014586



Sokvathara Lin

6018002

# What is ARMS?

- Assumption University Rooms Management System
- Allocate examination seats and rooms
- With existing subjects and students

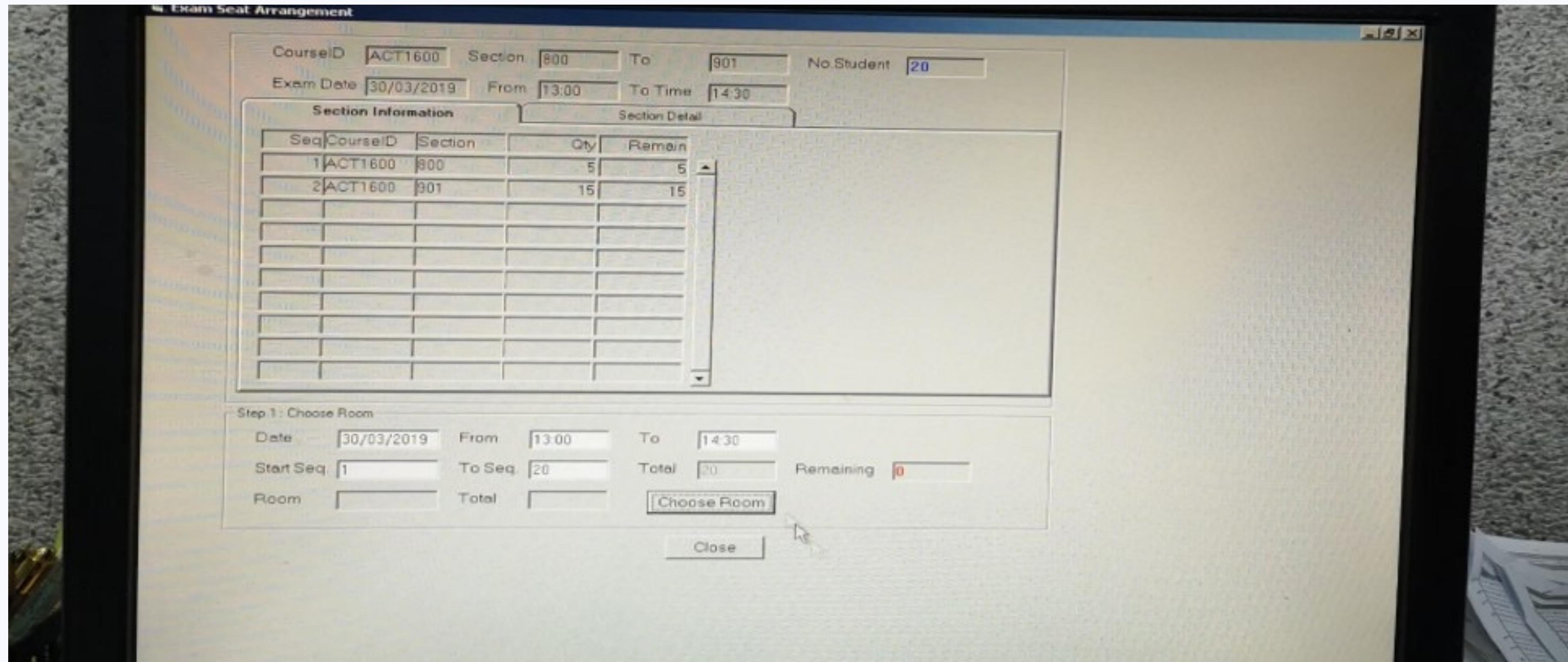


# Why do we need ARMS?

- 1 Paper-based arrangement process
- 2 Restart the arrangement process for each examination
- 3 No arrangement evaluation and performance indicator existed
- 4 Human Errors

## Subjects with sections and its students amount

# Rooms and seats allocation paper



## Manual Seat Allocation Program

Question Paper					
Date :	30/03/2019	Date :	30/03/2019	Time :	09:00-10:30
Subject :	<b>SA1201</b>	Subject :	<b>SA1201</b>	Total :	30
Room :	SG203	Room :	SG207		
Question Paper					
Date :	30/03/2019	Date :	30/03/2019	Time :	09:00-10:30
Subject :	<b>SA1201</b>	Subject :	<b>SA1201</b>	Total :	30
Room :	SG204	Room :	SG208		
Question Paper					
Date :	30/03/2019	Date :	30/03/2019	Time :	09:00-10:30

EXAM TYPE : QUIZZ

SEQ	ROOM	ADM.NO.	NAME	SECTION	SERT	SIGNATURE
1	SG203	5610378	MARIKA	H.	401	1/1
2	SG203	5617340	RSSRIPUTH	H.	401	1/2
3	SG203	5617687	PEERUMORN	P.	401	1/3
4	SG203	5617847	PRITCHAYA	W.	401	1/4
5	SG203	5647538	TURATEER	H.	401	1/5
6	SG203	5647877	JINHORN	W.	401	1/6
7	SG203	5711245	POOLADA	L.	401	2/1
8	SG203	5711315	NATTATHIWAT	T.	401	2/2
9	SG203	5713410	WISARU	C.	401	2/3
10	SG203	5712248	PINKANOK	H.	401	2/4
11	SG203	5712908	WICHAILORN	T.	401	2/5
12	SG203	5713942	NARTHANICHA	B.	401	2/6
13	SG203	5714708	WORAPORN	H.	401	3/1
14	SG203	5715122	AIRON PANSIRI	W.	401	3/2
15	SG203	5715251	THIRAPHOP	P.	401	3/3
16	SG203	5715545	NOON	C.	401	3/4
17	SG203	5717407	MONTAKORN	H.	401	3/5
18	SG203	5717483	THIRAPORN	C.	401	3/6
19	SG203	5717517	YTHEE	H.	401	4/1
20	SG203	5717526	CHAINARUN	H.	401	4/2
21	SG203	5717686	KITTIPHOP	S.	401	4/3
22	SG203	5717718	VEERINRADA	T.	401	4/4
23	SG203	5737650	DHONIKORN	S.	401	4/5

Exams Paper envelope's sticker

Seats announcement and attendance sheet .

CS3200 Senior Project I

ARMS | Assumption University Rooms Management System 7



## Why we need ARMS?

- 1 Paper-based arrangement process
- 2 Restart the arrangement process for each examination
- 3 No arrangement evaluation and performance indicator existed
- 4 Human Errors



## Why we need ARMS?

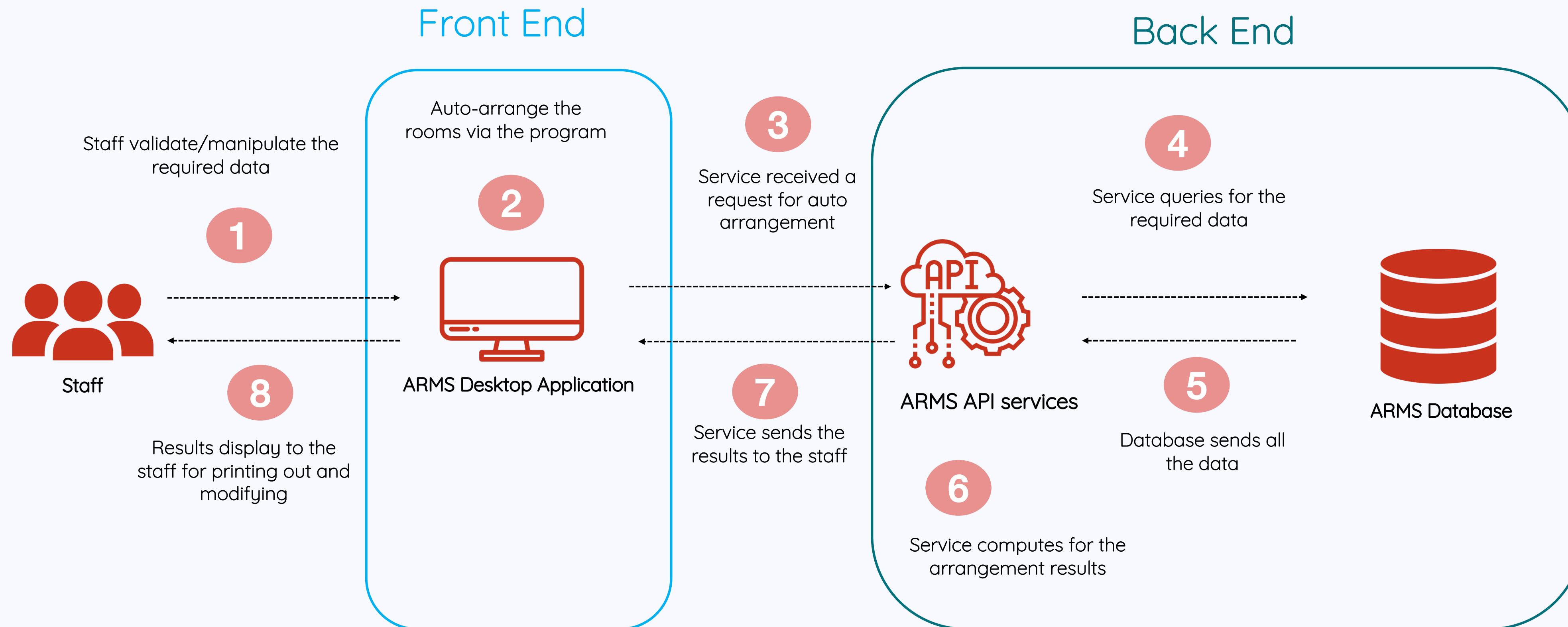
- 1 Paper-based arrangement process
- 2 Restart the arrangement process for each examination
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A close-up photograph of a person's hand holding a blue and white patterned pen, writing in a spiral-bound notebook. The notebook has horizontal ruling lines. The background is slightly blurred.

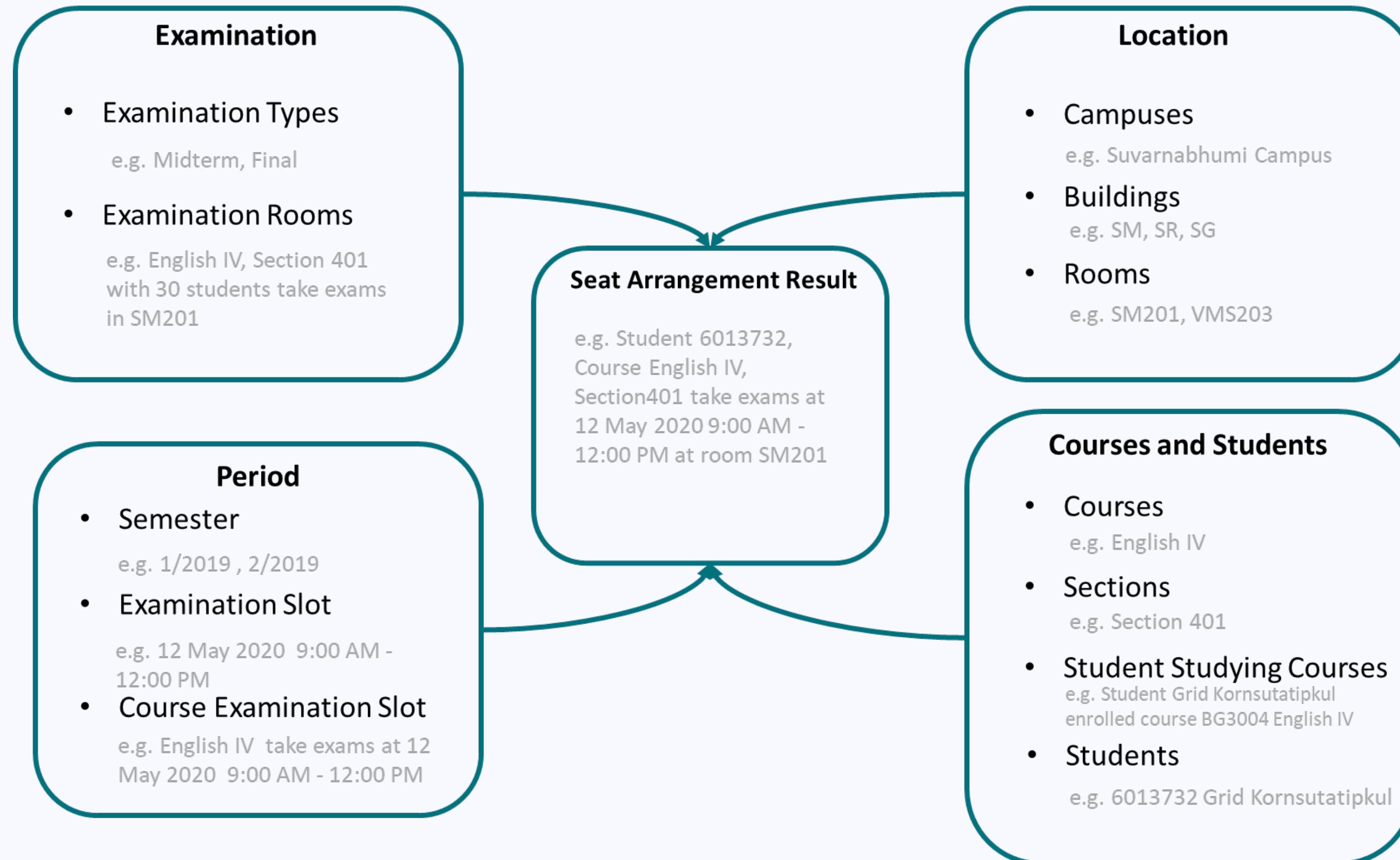
## Why we need ARMS?

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# System Diagram



# Examination Data



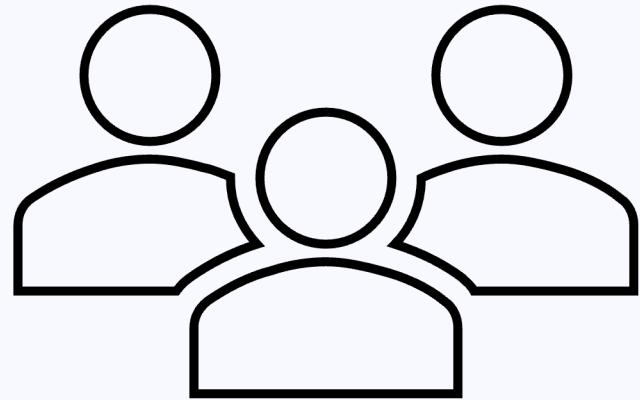
# Algorithms and Techniques

- Problem Description
  - Room Type
  - Campus
  - Seating Pattern
- Implemented Algorithms and Techniques
  - Iteration
  - Loop Unrolling
  - Best Fit
  - Bulk Insert
- Program's Constraints
  - Hard Constraints
  - Soft Constraints

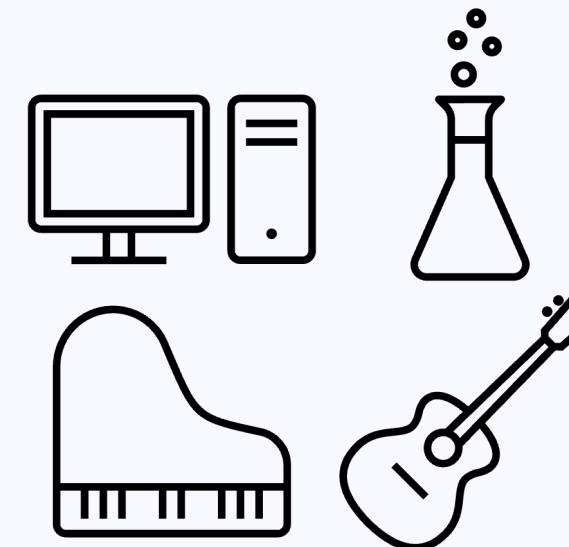
# Room Type

There are many types of room. Some of them can be used for automate assignment and cannot be used for automate assignment.

- Lecture room
- Seminar room
- Laboratory room
- Etc.



Large number of students



Requires specific equipment

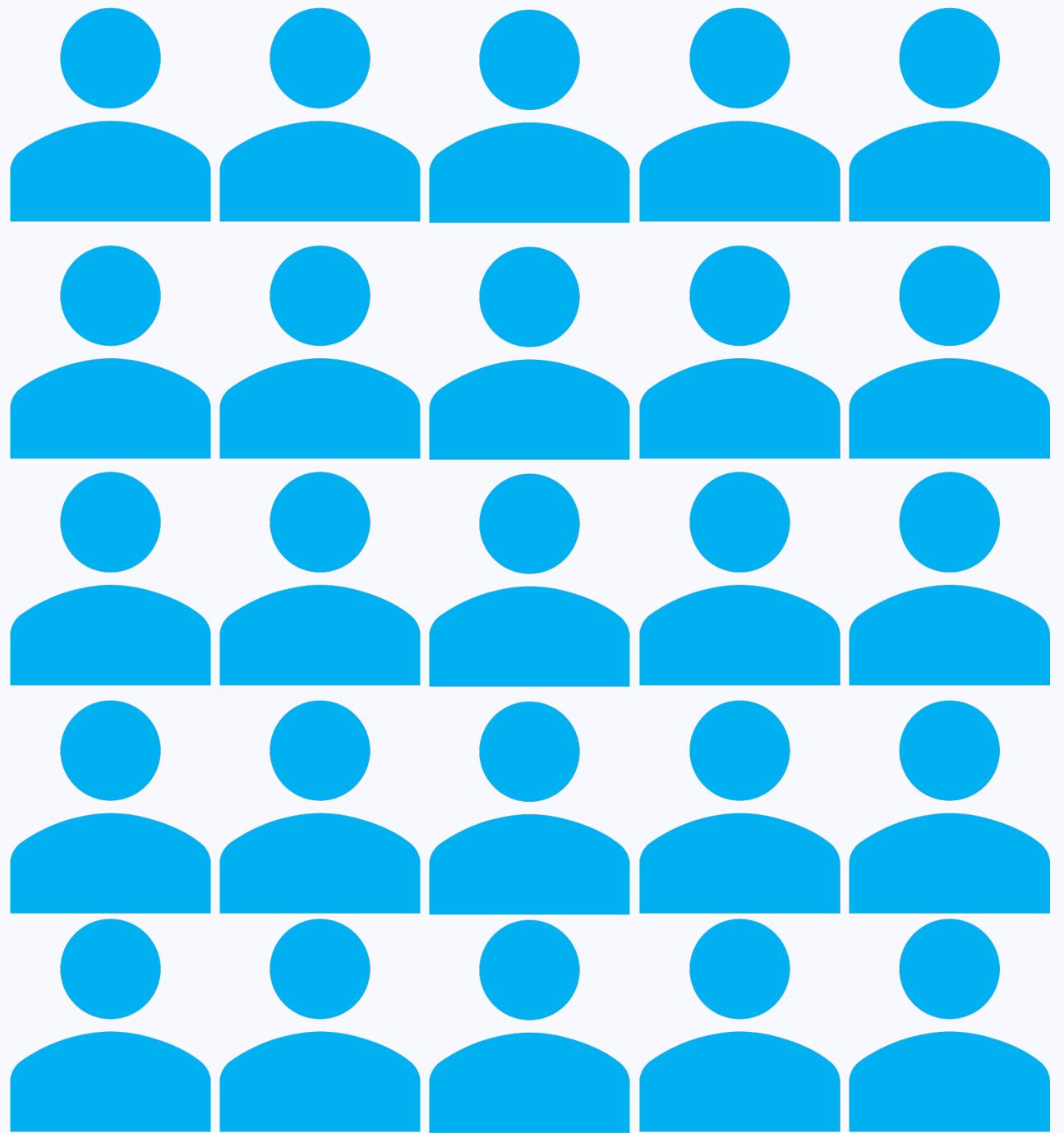
# Campus

Students must take the exams in the same campus that they chose to study the course.

For example, Student ‘A’ studies Computer Programming I in Suvarnabhumi campus and Selected Topic of Object-Oriented Concept in Huamak campus. In the examination, Student ‘A’ must take the exam for Computer Programming I in Suvarnabhumi campus and Selected Topic of Object-Oriented Concept in Huamak.

# Seating Pattern

There are 3 possible seating patterns



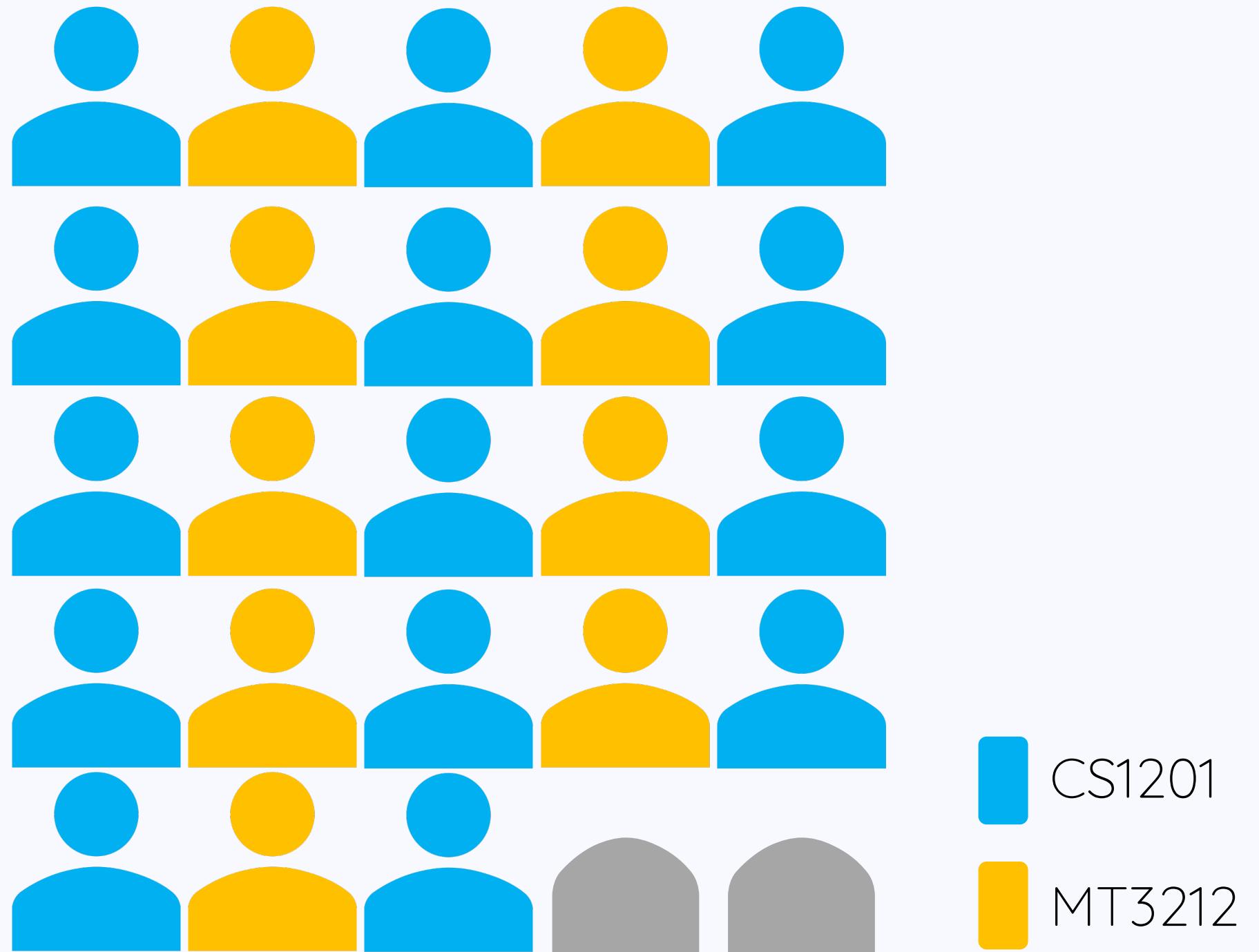
CS1201

## Full Seating Pattern

In the case of one examination room contains only one section or multiple sections from the same course. They will be arranged in full seating arrangement which tries to use every seat in the room.

# Seating Pattern

There are 3 possible seating patterns

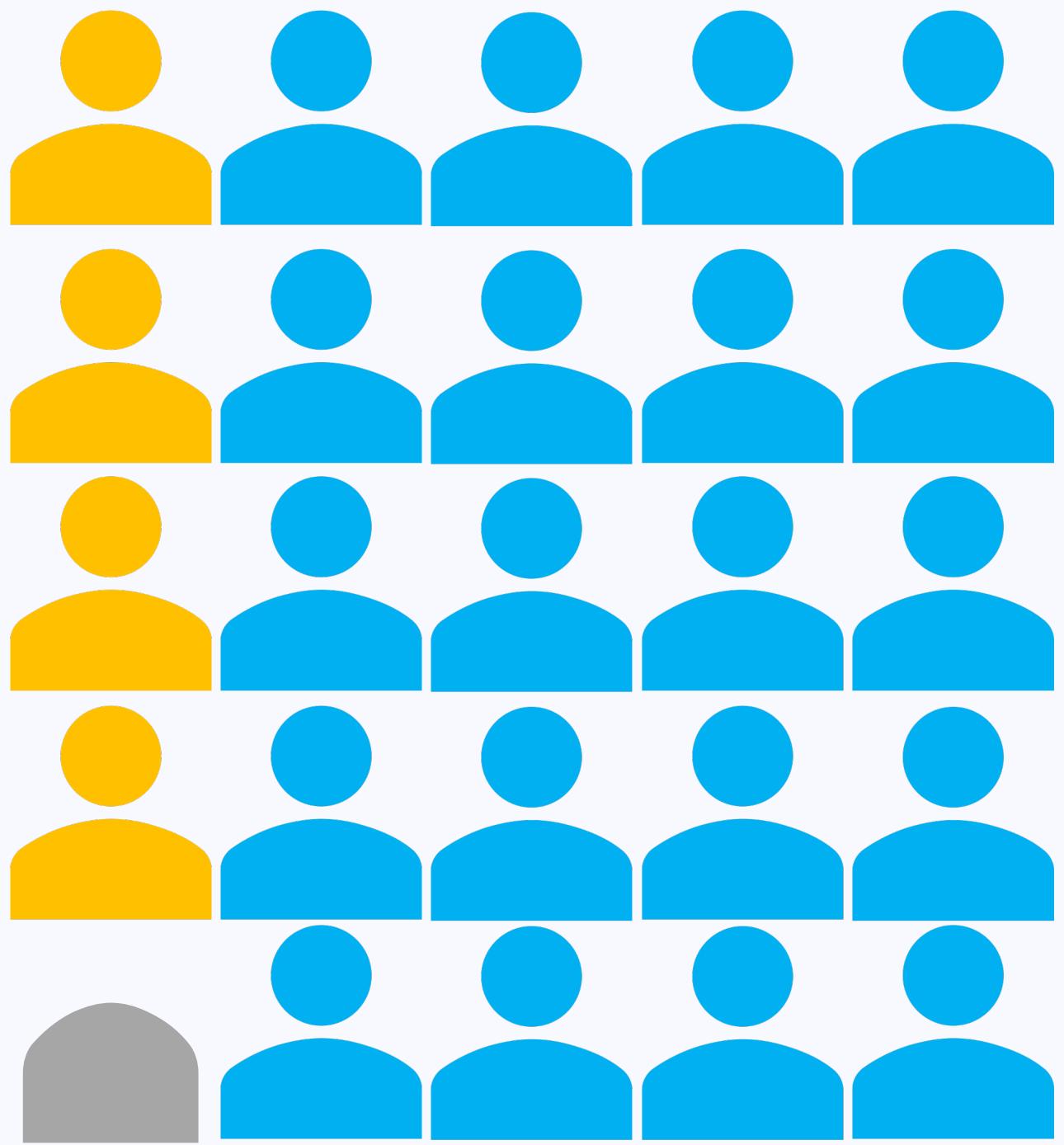


## Row-by-Row Seating Pattern

It is acceptable to have two courses in the same examination room. But courses must be arrangement in row-by-row pattern. Moreover, the both of them must have the number of students that can be used for arranging row-by-row pattern.

# Seating Pattern

There are 3 possible seating patterns



## One Row Seating Pattern

There is the case where the number of one section or course is unable to maintain row-by-row pattern whether because it is having less students or more students. Then, the filled-in section or course supposes to have the number of students to maintain one row seating pattern, in order to reduce the unused seats.

- CS1201
- MT3212

# Program's Constraints

## Hard Constraints

- H1 – For each examination, the number of total students must be less than or equal to the number of seats in each examination room.
- H2 – The total number of examination rooms in each examination period must be less than or equal to the number of available rooms in that examination period.
- H3 – The maximum number of courses in one examination room is two.
- H4 – Students must take the exams in the same campus that they chose to study the course.

## Soft Constraints

- S1 – The number of seat utilization in each room should be maximized.
- S2 – Minimizing room usage is also considered since it could save university resources.
- S3 – Users should be able to specifically assign courses into the specific rooms, in the occasion of having courses that require some special equipment for the examination.
- S4 – In the case of having two courses in the same room, seats should be arranged in row-by-row pattern with the suitable number of student.
- S5 – Every examination with the same courses should be assigned next to each other in a consecutive way.

# Implemented Algorithms and Techniques

## Iteration

- Grouped by examination slot and examination campus of courses.
- Sections ordered by course code and section number.
- Single sections ordered descending by the number of students.
- Campus's rooms that are available(unused) in the slot.

### Index 0

- Huamak campus
- 01/05/2019, 9:00-11:00
- Sections
- Single sections
- Rooms

### Index 1

- Huamak campus
- 01/05/2019, 12:00-14:00
- Sections
- Single sections
- Rooms

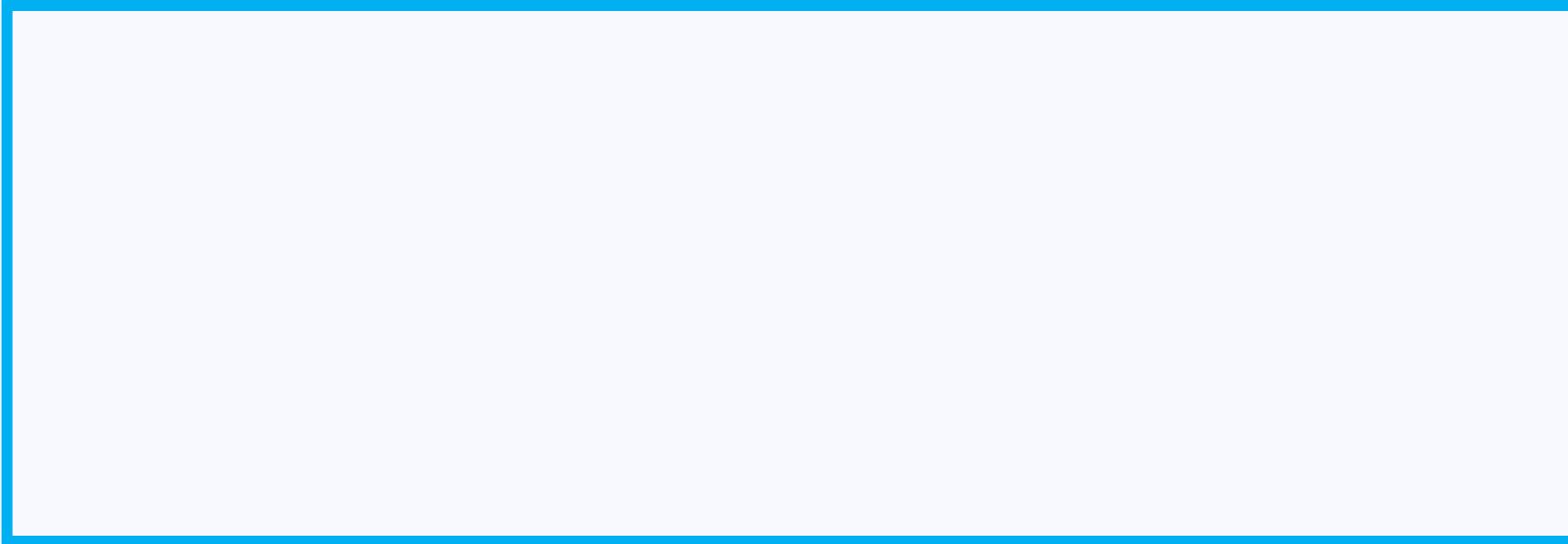
### Index 2

### Index 3

# Implemented Algorithms and Techniques

There are 3 cases in the iteration

Taken seats in room 0/30



Students left in section 30/30



1. The number of student is equal to seats in examination room

All students in the section will be assigned to the examination room  
and continue to the next room and section.

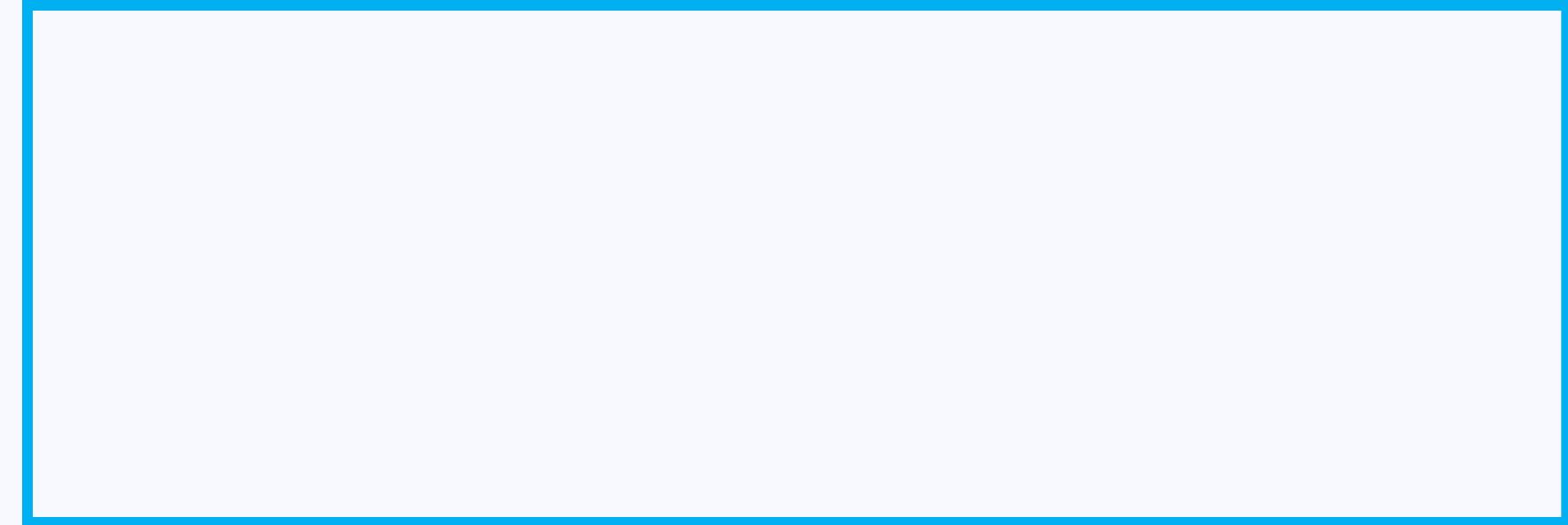
# Implemented Algorithms and Techniques

There are 3 cases in the iteration

Taken seats in room 30/30



Students left in section 0/30



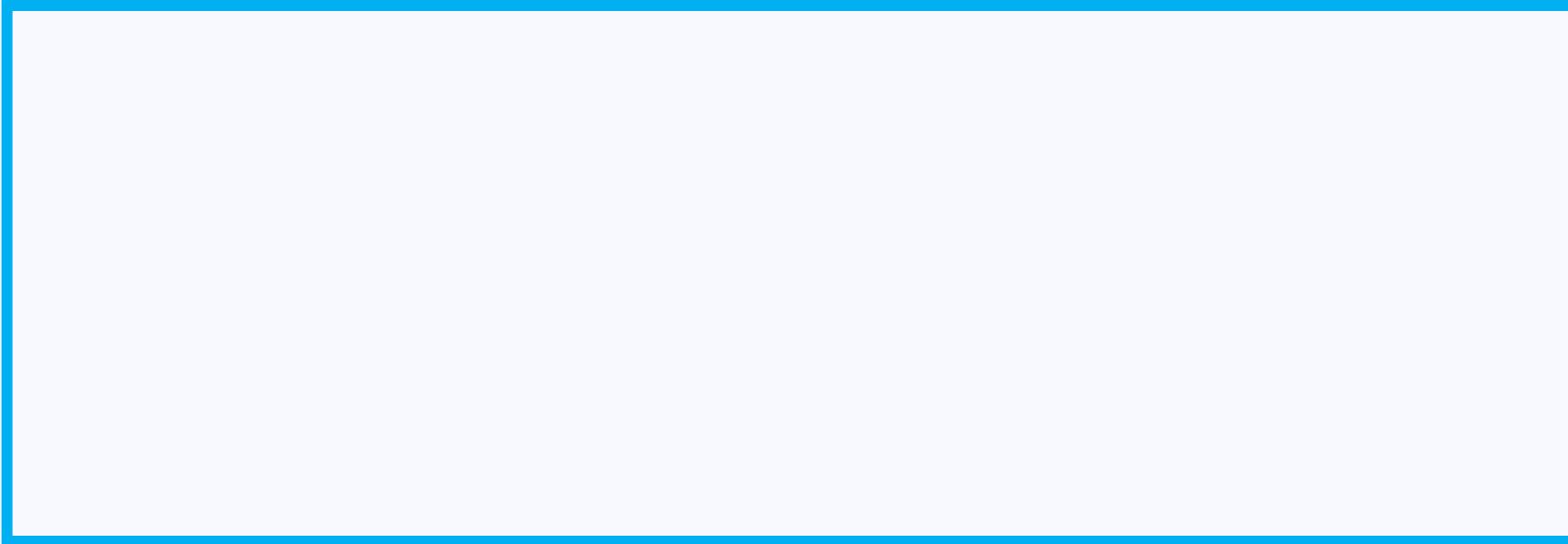
1. The number of student is equal to seats in examination room

All students in the section will be assigned to the examination room and continue to the next room and section.

# Implemented Algorithms and Techniques

There are 3 cases in the iteration

Taken seats in room 0/30



Students left in section 15/15



2. The number of student is less than seats in examination room

All students in the section will be assigned to the examination room  
and check the next condition.

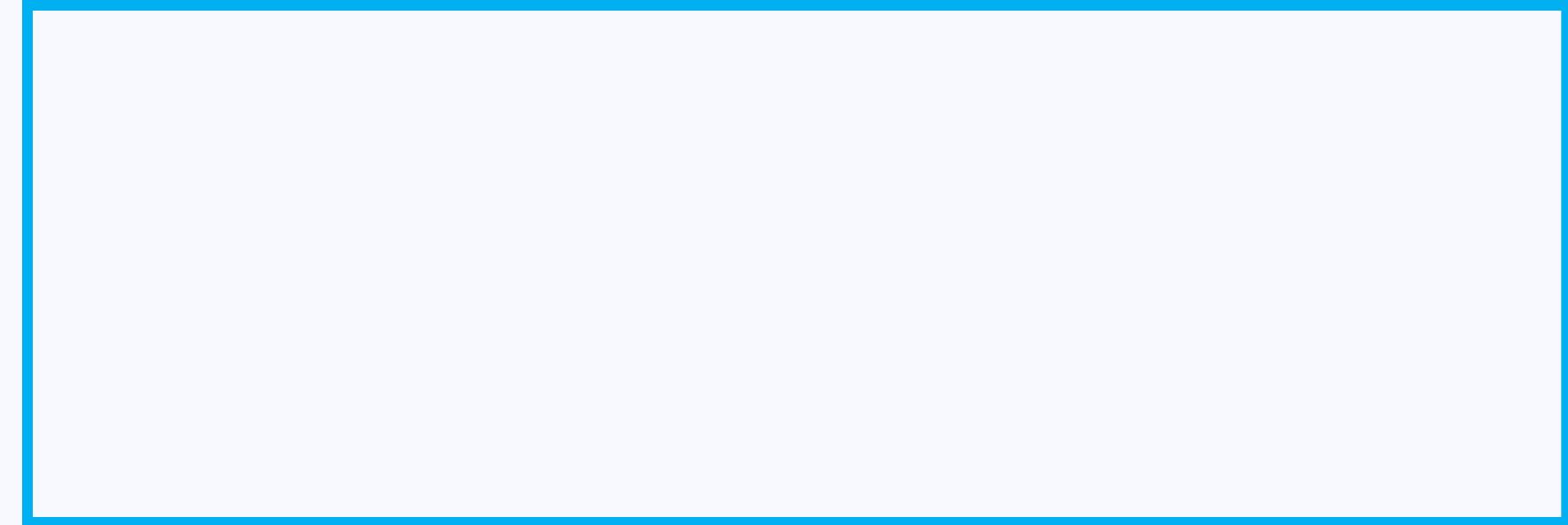
# Implemented Algorithms and Techniques

There are 3 cases in the iteration

Taken seats in room 15/30



Students left in section 0/15



2. The number of student is less than seats in examination room

All students in the section will be assigned to the examination room  
and check the next condition.

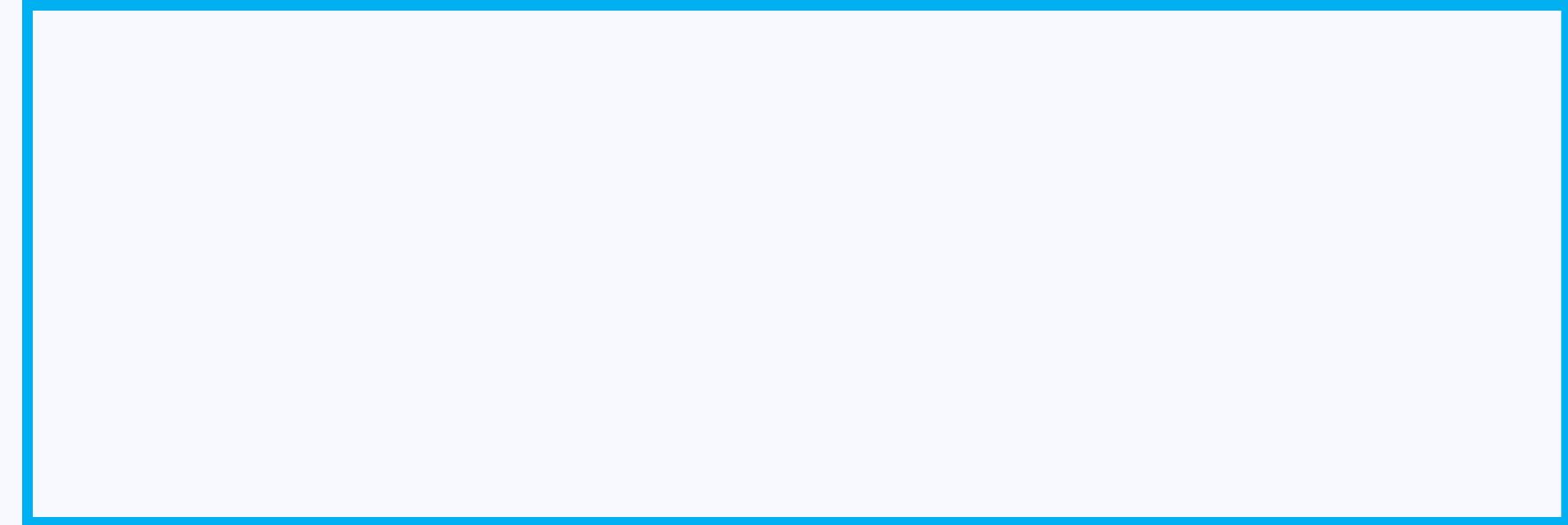
# Implemented Algorithms and Techniques

There are 3 cases in the iteration

Taken seats in room 30/30



Students left in section 0/15



Does it need filled-in section? (Loop Unrolling)

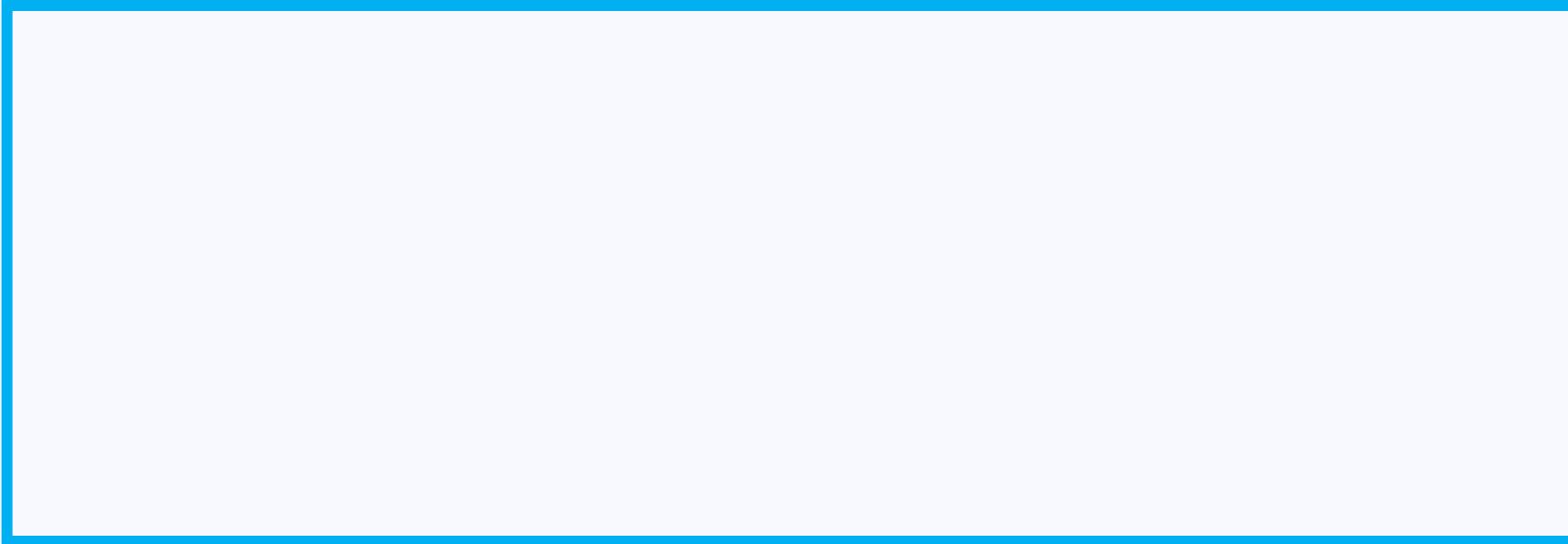
In case that the next section is different course, it should use the course that is very suitable and be able to construct row-by-row pattern or one row seating arrangement. The program will find the most suitable filled-in section (with Best Fit) and assign to the room.

But if it does not, the program will use the same room with available seat and go to the next section.

# Implemented Algorithms and Techniques

There are 3 cases in the iteration

Taken seats in room 0/30



Students left in section 45/45



3. The number of student is greater than the seats in examination room

Almost every students in the section will be assigned to the examination room and continue to the next room with the same section.

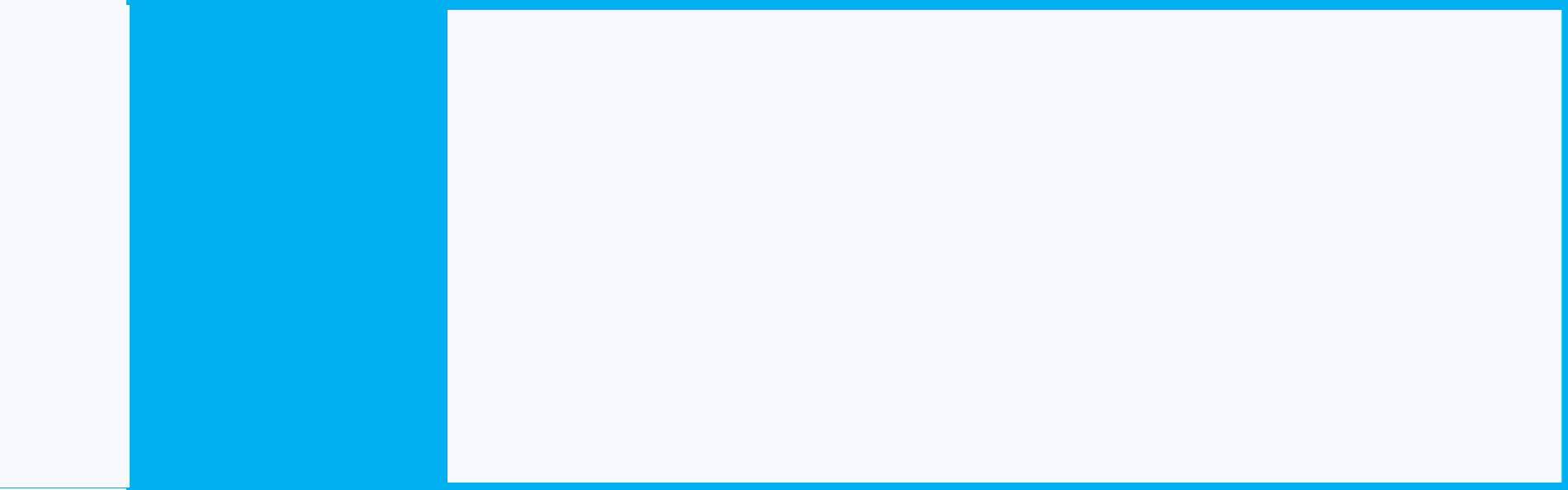
# Implemented Algorithms and Techniques

There are 3 cases in the iteration

Taken seats in room 30/30



Students left in section 15/45



3. The number of student is greater than the seats in examination room

Almost every students in the section will be assigned to the examination room and continue to the next room with the same section.

# Implemented Algorithms and Techniques

## Finding the most suitable section with Best Fit.

The program uses the section from course that has only one section, so it could satisfy constraint S1, S2 and S4 without violating constraint S5.

- S1 – The number of seat utilization in each room should be maximized.
- S2 – Minimizing room usage is also considered since it could save university resources.
- S4 – In the case of having two courses in the same room, seats should be arranged in row-by-row pattern with the suitable number of student.
- S5 – Every examination with the same courses should be assigned next to each other in a consecutive way.

### Index 0

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### Index 2

### Index 3

# Implemented Algorithms and Techniques

Given the number of student to fill in the room, return the Section that can satisfy it.

It will iterate through all list to find section with suitable number of student. The list of single student is sorted descending by the number of student because in the case of filled-in number is 15, it would prefer the section with 14 students than 10 students. Even though both can be used to filled

Filled-in amount = 15

Index 0

- Section 0
- 20 students

Index 1

- Section 1
- 14 students

Index 2

- Section 2
- 10 students

Index 3

- Section
- 3 students

# Implemented Algorithms and Techniques

The number of rows to be inserted to the database is humongous.

After the assignment is done, all data will be inserted to database, However, the amount of data is very huge and could take a couple minutes to finish.

In order to speed this process, Bulk Insert technique has been implemented to the program.

**Midterm 2/2019**

- 2,344 examination rooms
- 39,023 examination seats

**Final 2/2019**

- 2,679 examination rooms
- 43,169 examination seats

Inserting examination rooms and seat in Final, 2/2019 to database

Normal Insert – 38.579 seconds

Bulk Insert – 5.113 seconds



# Limitations

1

## Manual Pre-processing

Require manual pre-processing of data and triggered of integration service

2

## Multiple Academic Programs

No protocol implemented to handle the situation which each course contains multiple academic levels and academic programs which resulted in multiple Examination time.

# Conclusion and Future Work

ARMS is efficient examination seat allocation tool for Assumption University. It provides the effortless way to allocate the examination seat while minimize the resources consumed with the ease of perceived result to be evaluated.

## Fully Integrated

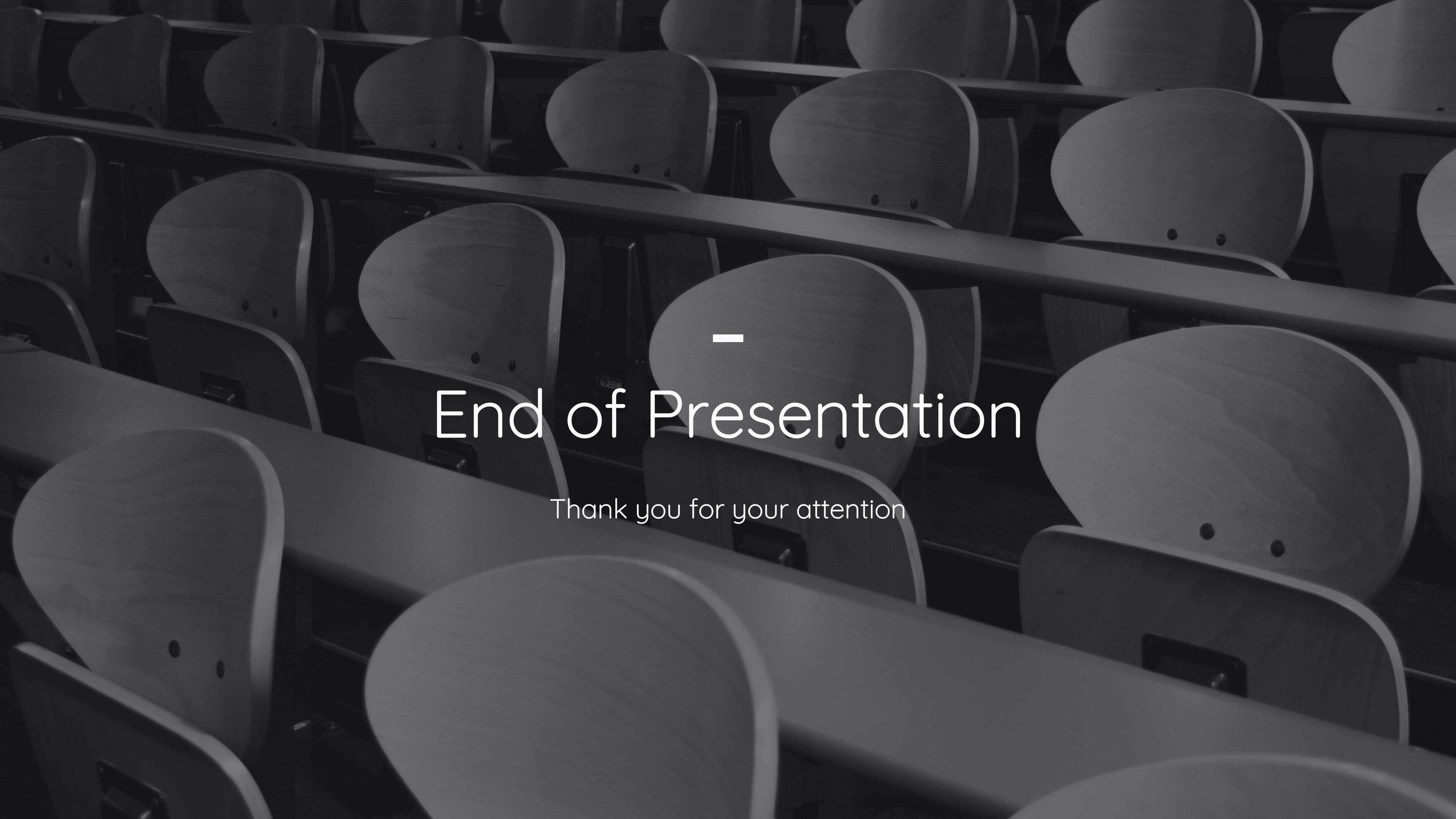
Implement the back-end system to be fully integrated with original sources of data

## Comprehensive Data Manipulation

More comprehensive data structure for better data manipulation and arrangement

## Classroom Arrangement

Could be applied to arrange the normal classroom and schedule

The background of the image is a dark, grayscale photograph showing rows of wooden theater-style seats. The seats are arranged in a semi-circular pattern, facing towards the center-left of the frame. The wood grain on the seats is visible, and the lighting creates a warm, focused glow on the front row, while the rest of the seating area is in deep shadow.

# End of Presentation

Thank you for your attention