Due date

4nd December 2019 Wednesday, 23.59

Goal

In this assignment, you will solve synchronization problem using semaphores and mutex. You should suffer from deadlock and/or starvation. You are expected to simulate and solve “DEU Library” synchronization problem, which its details are given.

Implementation Details & Requirements

On exam days at the DEU, you are waiting for a long time at the entrance of the working rooms in the library. We are launching the DEU Library application to facilitate this. This will prevent both all students to create long queues and to lock the working rooms before be full. Also it will provide an efficient and fair sharing because rooms will contain students up to its capacity.

With your simulation and solution with mutex and semaphores students hopefully will no longer wait so long for working.

- Each room has 4 students capacity.
- Students will come to library in continuously and random periods.
- The library has 10 working rooms and also 10 room keepers. So, each room contains one room keeper.
- The states for each room:
    - Entry free state: Room keeper will announce to the students his remaining places to get in the room, if it has one or more students in the room. For example, each room has 2 students and wait two more students, room keeper calls “The last two students, let's get up!”
    - Idle (Empty) state: If there is no student in the room, the room keeper will clean room. Being idle is forbidden for the room keepers. If any student came, they should open the working room. Don't forget to no student are waiting.
    - Full and busy state: If there are 4 students in the room, the room will be in busy state.
- The states for each student:
    - Waiting in room: When a student comes at room, she/he gets in the nearly full capacity room. If no student in room, first student alerts keeper if he is cleaning. And the students will study in the room until the room’s full. After the room is full, the students work in the room more and together they empty the room.
    - Waiting at library: If there is no empty room, she/he's gonna wait for a room at the library.
- You should not do the same room work constantly so that others can work overtime, so consider the status of starvation.

Submission

Submission will be via Github.

- GitHub Classroom Invitation link:

  https://classroom.github.com/a/Qt7GPaFx
- Name your code file as: *StudentNumber.c* (do not use another naming standard.)
- You will lose credit for not naming your submission properly. (15 pts)
- Late submission is not accepted.
- For this assignment you will work individual.
- The POSIX library (pthread) will be used.
- We compile your code with the below line:

```
gcc StudentNumber.c -o StudentNumber -lpthread
```

Academic Dishonesty

Your submissions will be scanned among each other as well as the Internet repository. Any assignments that are over the similarity threshold of a system for Detecting Software Similarity will get zero. We strongly encourage you not to submit your assignment rather than a dishonest submission.

Grading policy

- Submit properly (5 pts)
- Documenting the code and coding style (proper indentation, describe critical functions) (15 pts)
- Implementation of main function (Thread creation, join and semaphore initialize) (20 pts)
- Implementation of multi-thread structure (45 pts)
- Simulate each room on the console (15 pts)
  - For example you draw each room into a line

For Questions

For any questions about the assignment please use Classroom systems comments under Assignment announcement. Before asking your question, please check carefully previous questions and answers, where similar questions were already asked by someone else already answered.

- **No private questions via email will be answered!!!**
- Use classroom public messages to ask question, where someone else may benefit from and learn something from your question and its answers.
- We will try to answer any of your questions as soon as possible.

Good luck!!!

Read all of the instructions carefully, if you find something UNCLEAR, please ask help to CLARIFY it!