GRIFFITH COLLEGE DUBLIN

Course: Parallel and Distributed Programming
Module: PDP
Semester: Semester II
Assignment Number: 1 Threads, Locks and Semaphores
Date of Title Issue: 12th. March 2025
Assignment Deadline: 31th. March 2025
Assignment Weighting: 20/50
Please state the assignment title / brief. Please specify details such as: Answer the questions on the accompanying sheet.

Learning Outcomes
Please state the programme and related module learning outcomes that this assignment is assessing. 1,2,4, 5,6

Assessment Criteria
Please state the assessment criteria applied to this assignment, such as:

- Correctness of the work.
- Presentation, including compliance with the specified file format.
- Evidence of critical thinking and analysis.
- Originality, quality and thoroughness of the work.
- Research correct academic approach.
- Proper treatment of sources.

Upload the answer as ONE single java file ONLY.

*Academic Dishonesty: All of your assignments need to represent your own effort. Assignments should be done without consultation with other students and you should not share your source code with others. Any assignment submitted that is essentially the same, as someone else's will not be accepted**. ALL matching assignments will receive 0 credits.***

Your task is to simulate of college and classrooms: **There are four kinds of threads: students, visitors, monitor and a one Lecturer per classroom.**

Students must wait to enter classroom if class is running, if not running, enter. At some point, the Lecturer enters the classroom.

When the Lecturer is in the classroom, no one may enter, and the students may only not leave. Students can use **InSession** Boolean variable status to know if lecture is running or not, Visitors may leave.

The Lecturer can StartLecture. After some time, lecture ends the Lecturer leaves and all students can leave class. To make these requirements more specific, let's give the threads some functions to execute, and put constraints on those functions.

• students must invoke enter, and leave.

• The Lecturer invokes enter, startLecture, spend some time and leave.

• visitors invoke enter, and leave.

• While the Lecturer is in the classroom, no one may enter and students may not leave.

• At any point of time any classroom may have only one lecturer.

• Classroom capacity should not exceed limit. Visitors are always low in count (less than 5).

• Add a monitor thread to keep printing the status of each class as follows.

- College simulation runs continuously.
- Do not use code not explained in class, it indicates using AI tools.
- Simulate a college with few classrooms **{W201 (capacity 60), W202(capacity 60), W101 (Capacity 20), JS101 Capacity (30)}**
- And lecturers **{Osama, Barry, Faheem, Alex, Aqeel, Waseem}** that circulate between classes.
- Keep track of student and visitor count in each class.

Hints: Lecturer can use a binary semaphore to access classroom so one lecturer in class at any time students and visitors can use counted semaphores to access classroom. You can use locks, barriers, semaphores.

The running of the program should show something like the table below, that is updating every 2 seconds

Classroom	Lecturer	InSession	Students	Visitors
W201	Osama	True	50	3
W202	Alex	True	55	1
JS101	Faheem	True	15	0
W101	False	False		
W201	Waseem	True	54	5