



## GRIFFITH COLLEGE DUBLIN

**Course:** Parallel and Distributed Programming

**Module:** PDP

**Semester:** Semester II

**Assignment Number: 1 Threads, Locks and Semaphores**

**Date of Title Issue:** 24th. March 2021

**Assignment Deadline:** 11th. April 2021

**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 java files 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, enter, and then sitDown. At some point, the Lecturer enters the classroom. When the Lecturer is in the classroom, no one may enter, and the students may not leave. visitors may leave. Once all students check in, the Lecturer can StartLecture. After some time, the Lecturer leaves and all students can leave.

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, sitDown, and leave.
- The Lecturer invokes enter, startLecture and leave.
- visitors invoke enter, sitDown and leave.
- While the Lecturer is in the classroom, no one may enter and students may not leave.
- The Lecturer cannot startLecture until all students who have entered have also sitDown.
- 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

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.

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
W202	Aqeel	True	43	2
W101	Osama	True	18	1
JS101	Barry	True	25	2