

COMP2710: Project 5

Points Possible: 100

Deadline: 11:59pm Friday July 28th, 2023 (U.S. Central Time)

There should be no collaboration among students. A student shouldn't share any project code with any other student. Collaborations among students in any form will be treated as a serious violation of the University's academic integrity code.

In this project, you will write a program to simulate the Producer-Consumer Problem. A brief overview of the Producer and Consumer Model is provided below:

Producer and Consumer Model Introduction:

The Producer and Consumer Model is a model applied to schedule how concurrent processes and threads access shared resources. It consists of:

1. **Producer:** One or more processes/threads that produce (i.e., export) data to the shared buffer OR releases hardware resources.
2. **Consumer:** One or more processes/threads that take in (i.e., import) data from the shared buffer OR takes hardware resources.

A producer could also be relatively a consumer to the output of another producer and vice versa.

1. **Buffer:** The shared buffer that may be accessed by both the producer and the consumer and is accessed by the producer(s) to store resources and accessed by the consumer(s) to take resources.

General Guidelines:

Ensure that you abide by the following restrictions in developing your solution:

- You must create **exactly 1 producer** and **exactly 1 consumer** by creating a **thread** for each. **Note:** You must explicitly create two new threads, the thread that is created by default upon executing your program must **not** be used as the producer or consumer thread.
- You must create a shared buffer that is **accessible by both the producer and consumer threads** that can only be accessed by either the producer or consumer at any given time. You must ensure that the **producer and consumer cannot access the shared buffer at the same time.**
- The shared buffer **must** be able to **store at least 3 elements** (i.e., have a size of at least 3). No restrictions are imposed on what form the shared buffer takes so long as it meets the aforementioned restrictions.
- **Your producer thread must generate at most 1 element before releasing control of the shared buffer.**
- **Your consumer thread must consume at most 1 element before releasing control of the shared buffer.**
- You must properly **handle special cases** such as when the **shared buffer is empty or full.**
- You must **output readable print statements** (i.e., newline delimited at minimum) **displaying the activity of the producer and consumer threads.** No specific formatting restrictions are imposed aside from your output needing to be legible and uniform.
- You must allow for **graceful termination** and not rely on any mechanism to crash the simulation in order to end the simulation.

You will lose **at least 20 points** if **detailed** instructions for compilation and executing your simulation are not provided in the header comment of your source code file deliverable.

You will lose **at least 40 points** if there are compilation errors or warning messages when the TA compiles your source code. **You will lose additional points beyond those stated above if you:** do not use the specific program file name or do not have a comment on each file, function, and block of code in your program you hand in. **If your submission is not readable and easily understandable to someone who did not write the code, you may receive a grade of 0 regardless of if your solution is correct.**

Programming Environment:

Write a program in C++. **Compile and run it using AU server** (no matter what kind of text editor you use, please make sure your code could run on AU server, the only test bed we accept is AU server).

Deliverables:

- Submit your source code file named as “project5_LastName_UserID.cpp” through the Canvas system.

Late Submission Penalty:

- Late submissions are not accepted and will result in a **ZERO** without valid excuses, in which case you should talk to Dr. Li to explain your situation.
- GTA/Instructor will not accept any late submission caused by internet latency.