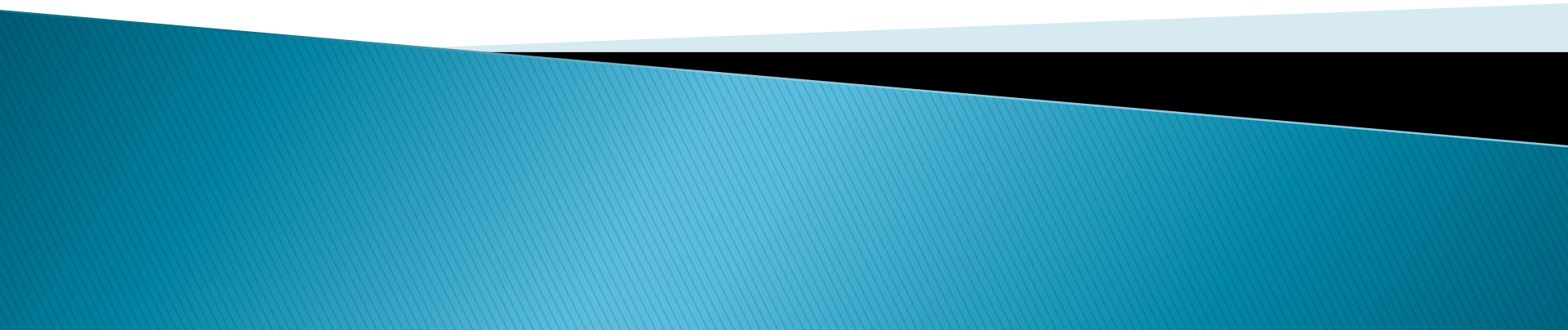


# 41012 Programming for Mechatronic Systems

Tutorial: Week 6



# Process vs Thread

- ▶ Do we need threading?
  - Accessing data?
  - Synchronisation?
  - Time critical (nondeterministic / stochastic)
- ▶ A process is a collection of threads and the associated program
  - <https://www.youtube.com/watch?v=O3EyzlZxx3g>

# Task 1: Threading / Mutex

- ▶ Create Two threads that access a variable
  1. First prints variable (Consumer)
  2. Increments variable (Producer)
    - What is best approach?

- ▶ Refer:

<http://www.cplusplus.com/reference/thread/thread/thread/>

# Task 2: Threading / Atomic

- ▶ Create Two threads that access a variable
- ▶ Both threads read and increment variable only if it is greater than random number drawn by the function (0–100)
  - What is best approach (atomic variable)
  - What happens if the variable is not atomic?
  - Can we use mutexes to protect variable?
- ▶ Refer:  
<http://www.cplusplus.com/reference/thread/thread/thread/>

# Task 3:

- ▶ Three threads should access same class
  - ▶ Class contains:
    - string name
    - vector of doubles
  - ▶ Thread 1
    - adds random number (from uniform distribution 0–100) to the vector of doubles
  - ▶ Thread 2
    - Removes numbers less than 20 and greater than 80
  - ▶ Thread 3
    - Keeps size of vector to max 20 elements, removes oldest element
  - ▶ Questions:
    - How best to protect data?
    - What should a efficient implementation do?
- 