جامعة خليفة
Khalifa University

Department of Electrical Engineering and Computer Science
COSC410- Parallel and Distributed Computing
PROJECT 1 _Fall 2025
Implementation of Parallel Integer Sort Algorithm

Overview:
In this project you will explore parallel implementation of an Integer sorting algorithm.

Project Statement:
Implement "Radix Sort": an Integer sorting algorithm to sort an array of integers in different parallel programming methodologies and compare the results in terms of performance and code quality.

Additional Requirements:
The project implementation should include:

1. Algorithm description and complexity analysis
2. Sequential implementation (most efficient possible).
3. Parallel implementations using Python multiprocessing/multithreading, pThreads, OpenMP, MPI, and Fork-Join pool in Java. (select atleast three methodologies)
4. Identification of parallel patterns (MapReduce, Manager-Worker, Producer-Consumer, Pipelines, etc.)
5. Performance profiling and comparisons with the sequential implementation. Amdahl's law.

Other instructions:

1. The program to generate array of random integers is uploaded on BB. Generate a sample set of 20 integers to print the sorted and unsorted array and the partial outputs.

2. Upload a **detailed PDF project report** (one per team of 2-3 students) before **23 NOVEMBER 2025** which should include the following:
- Cover page with Title of the project, Names, and ID Nos
- Introduction with **detailed description** of Problem Statement
- Algorithm description for sequential and all parallel implementations.
- Complexity analysis for all parallel implementations.
- Performance profiling (use performance graphs) and comparisons with the sequential implementation. Generate datasets of lengths upto 10000000.
- Text file of the program codes with **comments for each line**.
- **Screenshot of the results** of the implementation
- Conclusion
- References

3. Upload **source code files** for programs used in the project.