

# Workshop Agenda: Introduction to Computer Systems and Parallel Computing

## **August 17 (9 AM – 12 AM)**

1. Opening Remarks. – Head of the Department/ Department of Civil Engineering.
2. Introduction to the Workshop. – Dr. J. A. S. C. Jayasinghe (10 mins.)
3. Introduction to Computer Systems. – Mr. M. A. K. M. Dharmasiri (3 hrs.)
  - a. Types of Computers – Supercomputers, servers, cloud computing, workstations, personal computers.
  - b. Introduction to Hardware Components – CPU, GPU, APU, RAM, Storage devices, Motherboard, I / O devices, PSU
  - c. Benchmarking Your Hardware – Benchmark suites, monitoring and logging apps
  - d. Software
    - i. Types of Software
    - ii. System Software – Kernel, OS, drivers
    - iii. Some Important System Utilities – Check disk, defragmentation, backups, restore points, system monitor, network utilities.
  - e. Platforms
    - i. Multi boot
    - ii. Virtualization
    - iii. Windows Subsystem for Linux (WSL)
  - f. Computer Architecture – A very brief overview

## **August 24 (9 AM – 12 AM)**

1. Parallel Computing. – Mr. M. A. K. M. Dharmasiri (3 hrs.)
  - a. Overview – What is? Why use? Who is?
  - b. Concepts and Terminology
  - c. Parallel Computer Memory Architecture

- i. Shared Memory
    - ii. Distributed Memory
    - iii. Hybrid Distributed-Shared Memory
  - d. Parallel Programming Models
    - i. Shared Memory Model
    - ii. Threads Model
    - iii. Distributed Memory / Message Passing Model
    - iv. Data Parallel Model
    - v. Hybrid Model
    - vi. SPMD and MPMP
  - e. Designing Parallel Programs with Applications in MATLAB
    - i. Automatic vs. Manual Parallelization
    - ii. Understand the Problem and the Program
    - iii. Partitioning
    - iv. Communications
    - v. Synchronization
    - vi. Data Dependencies
    - vii. Load Balancing
    - viii. Granularity
    - ix. I/O
    - x. Debugging
    - xi. Performance Analysis and Tuning

### **August 31 (9 AM - 12 AM)**

1. Parallel Computing Examples with MATLAB – Mr. M. A. K. M. Dharmasiri (3 hrs.)
  - a. Parallel Computing Constructs in the Parallel Computing Toolbox, MATLAB
  - b. Examples with MATLAB
2. Closing Remarks - Dr. J. A. S. C. Jayasinghe (10 mins.)