Computational Laboratory for Life-cycle Structural Engineering

The room A140 in Imbt Laboratories is dedicated to the Computational Laboratory for Life-Cycle Structural Engineering, established in 2006. It consists of:

- Six Dell OptiPlex 7050MFF main desktops equipped with Core i7-7700T 2.9 GHz (up to 3.8 GHz) quad core processors, 16 GB of memory, and 512 GB SSD hard drives.
- Quad core (Intel Core i7-7700T @ 2.9 GHz) desktop serving for meetings and presentation purposes.
- One rack-type life-cycle computational server which are capable of speedily performing heavy-duty computational tasks
- Dell PowerEdge 730xd, Dual Intel Xeon E5-2670 v3 (12-core) at 2.3GHz,30M Cache, 128GB memory, 2TB storage, dual redundant power supplies.
- Dell Precision R5500n, Dual Intel Xeon X5675 (6-core) at 3.06 GHz, 24 GB DDR3 Memory, Dual 256 MB NVIDIA Quadro graphics card, dual redundant power supply, and two 500 GB-7200 RPM hard drives.

The interaction among the computational tasks used in life-cycle analysis/prediction and the integrated life-cycle management framework are presented next.
Interaction among Computational Tasks

1. Initial Structural Responses and Load Effects
2. Structural Properties
3. Internal Forces and Responses
4. Limit States and Probabilistic Parameters
5. Structural Reliability and Probability of Failure
6. Probability of Failure
7. Sustainability Assessment
8. Structural Performance Profiles and Inspection / Monitoring / Maintenance Parameters
9. Optimal Inspection / Monitoring / Maintenance Schedules
10. Information From Future Inspection / Monitoring
11. Updated Parameters

User Interface (e.g., MATLAB & Visual Script)

Initial SHM Information
Structural Analyses (e.g., ABAQUS)
Reliability Analyses (e.g., RELSYS)
Sustainability and Risk Analyses
Structural Optimization
Resistance and Demand Updating

OPTIMAL LIFE-CYCLE DECISIONS
Life-cycle Management Framework

Optimal decisions

- Updating predictions
- Information from inspection and structural health monitoring

Applications

- Structural performance assessment and prediction

Optimum maintenance and management strategies

Life cycle cost and performance analysis
- Sustainability
- Resilience
- Risk
- Reliability
- Optimization