



Allyn Girls

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REPORT ON : Modern Data Structures and Algorithms



XAVIER INSTITUTE OF ENGINEERING
(An Autonomous Institute under Mumbai University)
Approved by AICTE and recognized by DTE, Government of Maharashtra
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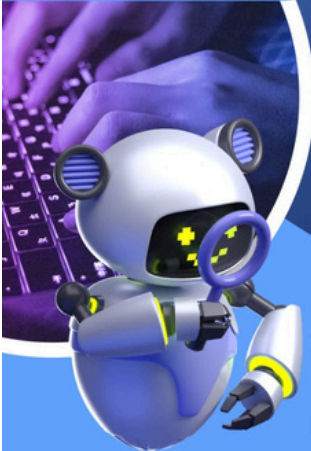
Mini – SDP on Modern Data Structures and Algorithms



Fr. Dr. Thomas Schwarz SJ

Why to Choose ?

Modern Data Structures and Algorithms bridges the gap between traditional coursework and contemporary practice, particularly in cloud computing. The course introduces advanced data structures such as Bloom filters and LH-trees. It also examines their interaction with computer architecture, storage systems, and distributed algorithms, while emphasizing performance evaluation and real-world applications.



Who can attend : ALLYN GIRLS

Date : 2-4 July, 2026
Time : 9:00 to 3:00
Venue : Computer Center



DURATION OF EVENT: 2-4 July, 2026

VENUE: Computer Center

TIME: 9:00 AM – 3:00 PM



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Introduction

The Mini-SDP on Modern Data Structures and Algorithms was organized by Allyn Girls, Xavier Institute of Engineering, from 2nd July to 4th July 2026 at the Computer Center. The workshop was conducted by Fr. Dr. Thomas Schwarz SJ, who shared his expertise on advanced data structures and algorithm design. The program was designed to bridge the gap between traditional data structures taught in classrooms and the modern techniques used in cloud computing, distributed systems, and large-scale software applications.

Throughout the three-day workshop, participants were introduced to several advanced concepts, including algorithm evaluation, hashing techniques, disjoint set data structures, dynamic programming, and performance optimization. The sessions focused on explaining the theoretical foundations while also demonstrating their practical applications through examples and discussions.

Objective(s)

- To understand the importance of modern data structures and advanced algorithm design.
- To learn efficient techniques for organizing, storing, and retrieving data.
- To study hashing methods and collision resolution techniques.
- To understand disjoint set data structures and their practical applications.
- To gain knowledge of dynamic programming and optimization strategies.
- To explore algorithm performance evaluation considering modern computer architecture.
- To develop analytical thinking and problem-solving skills through real-world examples.



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Workshop Structure & Learning Methodology

The workshop included:

- Concept-based lectures on advanced data structures and algorithms.
- Interactive discussions and doubt-solving sessions.
- Real-world examples demonstrating algorithm efficiency.
- Visual explanations using diagrams, illustrations, and coding examples.
- Performance analysis of algorithms on modern computer architectures.
- Practical applications of data structures in cloud computing and distributed systems.

The learning methodology focused on:

- Understanding concepts before implementation.
- Comparing classical and modern approaches to algorithm design.
- Learning through practical examples and case studies.
- Developing analytical thinking and problem-solving abilities.
- Exploring the role of data structures in modern software engineering.



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Modules Covered

Module 1: Algorithm Evaluation and Modern Computing

- Introduction to modern algorithm design.
- Performance evaluation of algorithms.
- RAM model and its limitations.
- Cache-aware and cache-oblivious algorithms.
- Branch prediction and speculative execution.
- Parallel computing and distributed computing.
- Importance of modern computer architecture in algorithm performance.

Module 2: Hashing Techniques

- Fundamentals of hashing.
- Hash functions and key mapping.
- Collision handling techniques.
- Linear probing.
- Quadratic probing.
- Chaining method.
- Cuckoo hashing and Robin Hood hashing.
- Applications of hashing in databases and search systems.

Module 3: Disjoint Set (Union-Find) Data Structure

- Introduction to disjoint sets.
- Operations:
 - Make-Set
 - Find-Set
 - Union
- Linked-list implementation.
- Forest representation.
- Union by Rank.
- Path Compression.
- Applications in graph algorithms and connected components.



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Module 4: Dynamic Programming

- Introduction to Dynamic Programming.
- Memoization.
- Tabulation.
- Divide and Conquer vs Dynamic Programming.
- Solving recursive problems efficiently.
- Domino tiling problem.
- Practical examples of optimization techniques.

Applications Discussed

The workshop also highlighted the application of modern data structures and algorithms in:

- Cloud Computing
- Distributed Systems
- Database Management Systems
- Large-scale Software Development
- High-performance Computing
- Network Applications
- Performance Optimization



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Outcomes of the program:

After successfully completing the Mini-SDP, participants were able to:

- Develop a strong understanding of modern data structures and algorithms.
- Learn advanced hashing techniques and collision resolution methods.
- Understand the implementation and applications of disjoint set data structures.
- Gain knowledge of dynamic programming techniques for optimization problems.
- Build confidence in selecting efficient algorithms for real-world computational problems.

Conclusion

The Mini-SDP on Modern Data Structures and Algorithms was an enriching and informative learning experience that introduced students to advanced concepts beyond the regular engineering curriculum. The workshop successfully connected theoretical knowledge with practical applications, enabling participants to understand how modern data structures and optimized algorithms improve the efficiency of software systems.

The sessions conducted by Fr. Dr. Thomas Schwarz SJ provided valuable insights into algorithm design, hashing techniques, disjoint set data structures, dynamic programming, and performance optimization. The workshop encouraged analytical thinking, efficient problem-solving, and an appreciation for modern computing technologies.



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Glimpse Of Event



Fig 1: Lecture Session on Modern Data Structures and Algorithms



Fig 2: Interactive Discussion during the Workshop



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Glimpse Of Event



Fig 3

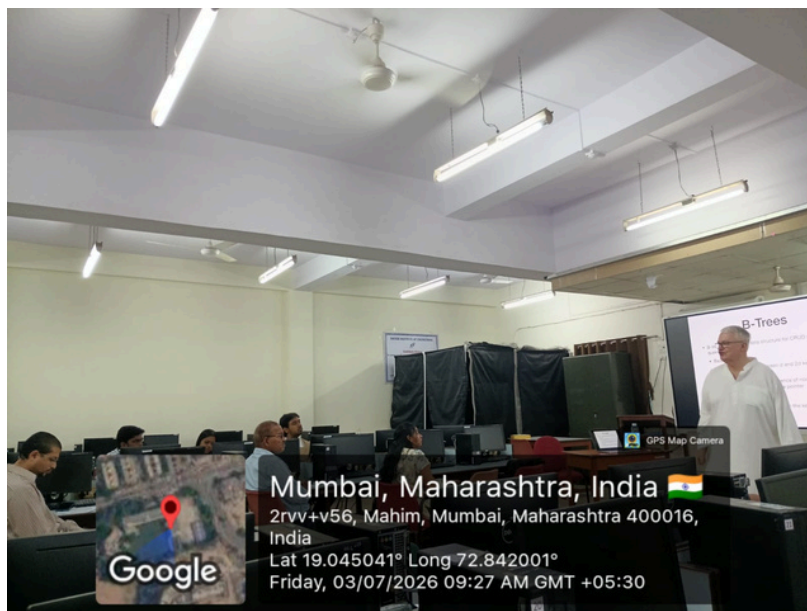


Fig 4

Prof. Smita Pawar
Allyn Girls Convener