



Children's Education Society's
THE OXFORD COLLEGE OF ENGINEERING
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(Approved by AICTE, New Delhi, Accredited by NBA, New Delhi & Affiliated to VTU, Belgaum)

Department of CSE
Report
Four Weeks Faculty Development Program (FDP)
On
“Advancements in” Storage Area Networks and Internet of Things”
(12th September-22 to 10th October-22)

Convener/Program Coordinator
Dr.R.Ch.A.Naidu
Professor and Head, Computer Science and Engineering Department

About Program

The objective of the Four Weeks Faculty development program on Advancements in (ML Storage Area Networks and Internet of things) was to enrich the knowledge of faculty, research scholars of all the discipline. The focus of the FDP was on Internet of things and its trending applications and on Storage Area Networks. The FDP sessions divide into several modules falling under the umbrella of Internet of Things and storage Area networks, Sensors and Actuators, , Edge Computing, Security and Privacy and IoT Platforms and Architectures ,SAN virtualization, Data Replication and Disaster Recovery, SAN Security, Converged and Hyper-Converged Infrastructure. The objective was to address modern trends in the field of IoT and SAN with real time problem solving. The FDP enriched with speakers hands-on sessions.

Date: 12th September to 10th October 2022

Time: Morning Session (FN):9.30 to 11:30 AM; Afternoon (AN) session: 2:00 to 3:30PM

Medium: Offline

Venue: The oxford college of Engineering

Faculty Coordinators: Prof. Seema and Prof. Shobha

Program Coordinator/Convener: Dr.E Saravana Kumar

Organizing Committee:

1. Dr.R.Ch.Naidu ,(Professor & HOD, Dept of CSE)
2. Dr.R.Kanagavelli, (Professor & HOD, Dept of ISE)
3. Dr.Puja Shashi, (Professor & HOD, Dept. of MCA)
4. Dr.Vanajaroselin E.Chirchi, (Professor)
5. Dr.E.Saravana Kumar, (Professor)
6. Dr.Buddesab,(Associate Professor)
7. Prof. Raghu ,(Assistant Professor)
8. Prof.Jesy Janet Kumari,(Assistant Professor)
9. Prof . Lenish Pramiee V,(Assistant Professor)
10. Prof.Asha Kumari, (Assistant Professor)


Target Audience:

1. Faculty members from various academic institutes/universities
2. Research Scholars
3. Industry Personnel


No. of Participants:

1. Academician-15
2. Industry Person-02

FDP Poster:



The poster features a dark blue background with a subtle circuit board pattern. At the top, a yellow horizontal bar is present. The text is primarily in white and yellow, with some red text for emphasis. The logo of Children's Education Society is in the top left corner. The title 'THE OXOFRD COLLEGE OF ENGINEERING' is prominently displayed in white. Below it, the address and accreditation details are listed. The department name is in yellow. The program title is in yellow, and the topic is in red. The dates and location are also in yellow. The names of the organizers are listed at the bottom in red.

 **CHILDREN'S EDUCATION SOCIETY(Regd.)**
THE OXOFRD COLLEGE OF ENGINEERING
Hosur Road, Bommanahalli, Bengaluru-560 068
(Approved by AICTE, New Delhi, Accredited by NBA, New Delhi & Affiliated to VTU, Belgaum)
Department of Computer Science & Engineering
PRESENTS
Four Weeks Faculty Development Program
ON
“Advancements in” Storage Area Networks and
Internet of Things”
12th September 2022 to 10thOctober 2022
5th Floor Seminar Hall, New Building

| | | |
|-----------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------|
| Convener Dr. R. CH. A. Naidu Prof & HOD of CSE The Oxford College of Engineering | Patron Dr.N.Kannan , Principal, The Oxford College of Engineering | Chief Patron Shri.S.N.V.L. Narashima Raju , Chairman, The Oxford College of Institution |
|-----------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------|

List of Faculties registered for 4 weeks FDP

| SL NO | Name of Faculty | Department | Designation |
|-------|----------------------|------------|-------------|
| 1. | Ms.jesy Janet Kumari | CSE | Asst. Prof. |
| 2. | Ms. Bindyashree | ISE | Asst. Prof. |
| 3. | Ms.Rekha | CSE | Asst. Prof. |
| 4. | Ms.Manasa | CSE | Asst. Prof. |
| 5. | Mr.YaduKrisna | ISE | Asst. Prof. |
| 6. | Ms.Vidya | ISE | Asst. Prof. |
| 7. | Mr.Dharmaveer | MCA | Asst. Prof. |
| 8. | Ms. Sathya M | CSE | Asst. Prof. |
| 9. | Mr.J.C.Achutha | MCA | Asst. Prof. |
| 10. | Ms. Shruthi K | CSE | Asst. Prof. |
| 11. | Ms. Lenish Pramiee V | CSE | Asst. Prof. |
| 12. | Mr.Ashok B P | MCA | Asst. Prof. |
| 13. | Ms.Asha Kumari | CSE | Asst. Prof. |



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CERTIFICATE OF PARTICIPATION

*This is to Certify that **Ms. Manasa S M** Department of CSE, has participated in the 4 weeks Faculty Development Program titled "Advancements in" Storage Area Networks and Internet of Things" organized by The Oxford College of Engineering from (12th September-22 to 10th october-22)*

Dr. R. CH. A Naidu

Coordinator

HOD, Dept. of CSE, TOCE

Dr. N. KANNAN

PRINCIPAL

TOCE

Day 1: 12th September 2022

Session 1: (9:30 AM to 11:30 AM) Inaugural function

The FDP has aim and focus that all the participants should acquire the knowledge in the field of IoT and SAN so the Inauguration began the invocation song in presence of college principal, Director, HODs and the participants. After that Chief Guest of the program has declared the opening of FDP.

Session 2: (2:00 PM to 3:30 PM) SAN Technologies by Dr. R. Ch. Naidu Professor and HoD/ CSE

In the session on SAN, Dr. R. Ch. Naidu Professor and HoD/CSE covered overview and applications of. These topics provide a comprehensive understanding of SAN technology, its components, protocols, security, performance optimization, management, and backup strategies.

Day 2: 13th September 2022

Session 3: (9:30 AM to 11:30AM) SAN Components and Architecture by Dr.R.Kanagavalli Professor& HoD/CSE

In the session of SAN Components and Architecture the speaker focused on the basics, applications of the components and Architecture. Speaker took us with discussion of the key components of a SAN, including storage arrays, switches, host bus adapters (HBAs), and how they are interconnected to create a SAN infrastructure. Explain different SAN architectures such as FC-SAN, FCoE, and iSCSI. Explained, how we can calculate performance metrics such as accuracy, True negative, true positive etc.

Session 4: (2:00PM to 3:30 PM) SAN Storage and Protocols by Dr.E.Saravana Kumar

In this session, Exploring these SAN storage protocols in more depth will provide faculty members with a comprehensive understanding of their underlying principles, features, deployment considerations, and interoperability within SAN environments. Fibre Channel is a high-speed networking protocol designed for SANs. It provides a reliable, lossless, and scalable connection between servers and storage devices. Advanced topics related to FC can include FC standards (FC-4, FC-8, etc.), frame structure, flow control mechanisms, and advanced features like NPIV (N-Port ID Virtualization) and FCoE (Fibre Channel over Ethernet). Fibre Channel over Ethernet is a protocol that encapsulates Fibre Channel frames within Ethernet frames, allowing Fibre Channel traffic to be carried over Ethernet infrastructure. Internet SCSI is a protocol that allows SCSI commands to be transported over IP networks, enabling SAN connectivity over standard Ethernet infrastructure. NVMe over Fabrics is a protocol that extends the high-performance NVMe storage protocol over a network, allowing direct access to NVMe storage devices from remote server.

Day 3 : 14th September 2022

Session 5: (9:30 AM to 11:30AM) by Dr.N.KannanPrincipal/TOCE

In this session,SCSI is a protocol that allows SCSI commands to be transported over IP networks, enabling SAN connectivity over standard Ethernet infrastructure. Advanced topics can include iSCSI architecture, iSCSI initiators and targets, iSCSI naming and discovery, iSCSI security considerations, and performance optimization techniques.

Session 6: (2:00PM to 3:30 PM) Infiniband by Dr.Puja Professor & HoD/MCA Explanation made by the speaker was remarkable, she started the presentation from InfiniBand is a high-speed networking protocol that can be used as a SAN storage protocol. It provides low-latency and high-bandwidth connectivity for SAN environments. Advanced topics can include InfiniBand architecture, InfiniBand fabric management, RDMA (Remote Direct Memory Access) over InfiniBand, and integration with SAN storage solutions. Speaker explained the proceeding for analytics ie understanding data for learning or analysis, participants were very happy to receive such information.

Day 4: 15th September 2022

Session 7: (9:30 AM to 11:30AM) Emerging Trends in SAN by Dr.Shobha /TOCE

Non-Volatile Memory Express (NVMe): Introduction to NVMe technology, benefits, and its impact on SAN performance. Software-Defined Storage (SDS): Understanding the concept of SDS, benefits, and considerations for implementing SDS in SAN environments. Hyper-Converged Infrastructure (HCI): Overview of HCI architecture, integration of compute and storage, and its relationship with SAN.

Session 8: (2:00 PM to 3:30PM) SAN Virtualization and Cloud Integration by Dr.Seema Patil /TOCE

Speaker briefed about Storage virtualization techniques: Overview of storage virtualization appliances and software-defined storage (SDS). Integration with cloud environments: SAN considerations for hybrid cloud deployments, cloud storage gateways, and data migration strategies.

Day 5: 16th September 2022

Session 9: (9:30 AM to 11:30AM) SAN Data Services by Dr.Bindhu Madhavi /TOCE

Speaker highlighted various advanced topics about Synchronous vs. asynchronous replication, remote mirroring, and disaster recovery considerations. Understanding point-in-time copies, differential and copy-on-write snapshots, and their applications. Data de duplication and compression: Techniques to reduce storage footprint and optimize SAN capacity. Speaker gave lot of useful information about the topics which highlighted recent trends and applications.

Session 10: (2:00 PM to 3:30PM) Fibre Channel (FC) Protocol by Dr.Shashidhara /TOCE

Introduction to FC protocol about FC layers, frame structure, and addressing, different types of topologies such as FC-AL, FC-AL-2, and switched fabric. Fibre addressing concepts World Wide Names (WWNs) and Domain ID concepts were briefly discussed. Port zoning and WWN zoning topics were briefed. Speaker gave many inputs about the topics.

Day 6: 19th September 2022

Session 11: (9:30 AM to 11:30AM) SAN Troubleshooting and Performance Tuning by Dr. Vanajaroselin E.Chirchi, /TOCE

Speaker started with warm introduction about the topic in more interesting way Troubleshooting common SAN issues to Identify and resolve connectivity problems, performance bottlenecks, and data integrity concerns. Performance tuning strategies to optimize SAN performance through load balancing, queue management, and storage tiering. Speaker conducted topics with interactive sessions and many things were explained by asking questions.

Session 12: (2:00 PM to 3:30PM) Automation and Orchestration in SAN by Dr.Buddesab /TOCE

Storage provisioning automation Tools and technologies for automating SAN provisioning processes. Storage provisioning automation Tools and technologies for automating SAN provisioning processes. Software-Defined Networking (SDN) SDN concepts and their application in SAN management.

Day 7:20th September 2022

Session 13: (9:30 AM to 11:30AM) Storage Tiering and Quality of Service by Shyamsundar /Atos India Pvt Ltd

Tiered storage architectures ,understanding the concept of storage tiers based on performance and cost. Automated tiering Policies and algorithms for moving data between different storage tiers. QoS in SAN, Provisioning and managing performance levels for critical workloads. Industry resource person spoke about the current advancements about this topic.

Session 14: (2:00 PM to 3:30PM) Multi-Pathing and High Availability by Dr E Saravana Kumar/TOCE

Multi-pathing strategies such as Path redundancy, load balancing, and failover techniques were briefed.High availability configurations, Active/active and active/passive setups. Dynamic Multi-Pathin, Managing multiple paths and optimizing I/O distribution. Sir has made the session very interesting and interactive with many examples.

Day 8:21th September 2022

Session 15: (9:30 AM to 11:30AM) SAN Scaling and Convergence by Dr.Buddesab/TOCE

Scale-out SAN architectures: Adding storage capacity and performance seamlessly.Converged SAN and IP networks: Integration of SAN and IP networks for cost savings and simplified management.Scalability considerations: Planning for future growth, non-disruptive expansion, and performancescalng.

Session 16: (2:00 PM to 3:30PM) SAN and Cloud Storage Integration by Dr.Vanajaroselin E.Chirchi. /TOCE

Cloud storage models helps in understanding different cloud storage models (public, private, hybrid) and their integration with SAN. Exploring technologies that facilitate the integration of on-premises SAN with cloud storage. Strategies for migrating SAN data to cloud storage services were discussed.

Day 9 :22nd September 2022

Session 17: (9:30 AM to 11:30AM) SAN Performance Testing and Benchmarking by Dr.Shobha /TOCE

Planning, executing, and analyzing performance tests in SAN environments, Generating realistic workloads for performance testing and benchmarking SAN systems, Overview of industry-standard tools used for benchmarking SAN performance.

Session 18: (2:00 PM to 3:30PM) Data Migration in SAN by Dr Seema Patil /TOCE

Storage migration techniques and Strategies for moving data between storage arrays or SAN environments. Data migration tools overview of tools and methodologies for performing data migrations with minimal disruption. Data migration planning and best practices: Considerations for effective data migration planning and risk mitigation.

Day 10 :23rd September 2022

Session 19: (9:30 AM to 11:30AM) Storage Consolidation and Virtualization by Dr.Shobha /TOCE

Exploring the advantages of consolidating storage resources into a centralized SAN, Overview of storage virtualization solutions and their role in SAN consolidation. Understanding the concept of allocating storage capacity on-demand and optimizing SAN utilization.

Session 20: (2:00 PM to 3:30PM) real time applications on SAN by Dr Bindhu Madhavi/TOCE

Discuss and demonstrate real-time monitoring tools and techniques used to collect performance data from SAN components, such as switches, hosts, and storage arrays. Highlight the importance of monitoring metrics like IOPS, latency, bandwidth utilization, and queue depths. Explore strategies for reducing latency in real-time SAN applications. Discuss techniques like optimizing switch configurations, tuning host initiators and storage targets, and leveraging high-

speed interconnects like Fibre Channel over Ethernet (FCoE) or Non-Volatile Memory Express (NVMe). Discuss methods for managing bandwidth in real-time SAN applications to ensure consistent and predictable performance. Cover topics such as Quality of Service (QoS), prioritizing traffic, and implementing bandwidth allocation and reservation techniques.

Day11: 26thSeptember 2022

Session21: (9:30AMto11:30AM)Edge Computing by Dr. R. CH.A Naidu, HOD Dept. of CSE, TOCE:

With the increasing number of IoT devices and the need for real-time data processing, edge computing has gained prominence. It involves processing data at the edge of the network, closer to the IoT devices, rather than sending all the data to the cloud. This approach reduces latency, improves data privacy, and enhances overall system performance.

Session 22: (2:00PM to 3:30 PM)IoT Security by Dr. E Saravana Kumar, Professor, TOCE:

As IoT devices become more widespread, ensuring their security becomes crucial. Topics such as secure device provisioning, authentication, encryption, secure communication protocols, and vulnerability management are essential for protecting IoT systems from cyber threat.

Day12: 27th September 2022

Session23:(9:30AMto11:30AM)AI and Machine Learning in IoT by Dr. KanagavelliHOD Dept. of ISE, TOCE:

The integration of artificial intelligence (AI) and machine learning (ML) techniques with IoT can enable intelligent decision-making and automation. This includes using ML algorithms for predictive maintenance, anomaly detection, and data analytics to extract valuable insights from IoT-generated data.

Session 24:(2:00PM to 3:30 PM)IoT Data Analytics byDr.VanajoselinE.Chirchi:

With the enormous amount of data generated by IoT devices, effective data analytics techniques are needed to derive meaningful insights. This includes topics like big data processing, data visualization, real-time analytics, and stream processing techniques to handle the velocity, volume, and variety of IoT data.

Day13 : 28thSeptember 2022

Session 25: (9:30 AM to 11:30AM)IoT Applications in Smart Cities by Dr. Roopa M S, Associate Professor, DSCE:

Smart city initiatives leverage IoT technologies to improve urban infrastructure, transportation, energy management, and public services. Exploring IoT-based solutions for smart parking, waste management, environmental monitoring, and citizen engagement can be a valuable topic for FDP.

Session 26: (2:00PM to 3:30 PM) Industrial IoT (IIoT) by Dr. Savitha Mathapathi Associate Professor, DSCE:

IIoT focuses on the use of IoT in industrial settings to optimize processes, enhance productivity, and reduce costs. Topics like industrial automation, predictive maintenance, asset tracking, and condition monitoring using IoT devices can be explored in an FDP.

Day14: 29thSeptember 2022

Session 27: (9:30 AM to 11:30AM) IoT Interoperability and Standards by Dr. Muthi Reddy P, Professor, REVA University:

Ensuring interoperability among various IoT devices and platforms is essential for seamless integration and communication. Topics related to IoT protocols, standards (such as MQTT, CoAP, and OPC UA), and interoperability challenges can be discussed in the FDP.

Session28: (2:00PMto3:30PM)Energy Efficiency in IoT by Dr. Vinutha, Associate Professor, DSCE:As IoT devices proliferate, energy consumption becomes a concern. Exploring energy-efficient design principles, low-power communication protocols, and energy harvesting techniques for IoT devices can be an interesting topic.

Day15: 30thSeptember2022

Session29:(9:30AMto11:30AM)Privacy and Ethical Considerations in IoT by Dr. Jeevitha B K, Associate Professor, VKIT:

The widespread deployment of IoT devices raises privacy concerns and ethical considerations. Topics like data privacy, consent management, transparency, and the ethical implications of IoT can be explored in the FDP.

Session30: (2:00 PM to 3:30PM) IoT Use Cases in Healthcare by Dr. Bhavya M, Associate Professor, DON Bosco Institute of Technology:

IoT has the potential to revolutionize healthcare by enabling remote patient monitoring, personalized medicine, and improved healthcare delivery. Discussing IoT use cases in healthcare, including wearable devices, telemedicine, and health data analytics, can be an engaging topic.

Day 16: 3rd October 2022

Session 31: (9:30 AM to 11:30AM) Blockchain for Secure and Trustworthy IoT Networks by Dr. Niranjana, Associate Professor, DSCE:

The Resource person has discussed about the importance of Explore how blockchain technology can enhance security, privacy, and trust in IoT networks by providing decentralized and immutable transaction records.

Session 32: (2:00 PM to 3:30 PM) Fog Computing: Extending the Cloud to the Edge in IoT by Dr. Ramya, Associate Professor, DSCE:

Learn about fog computing, a paradigm that brings cloud computing capabilities closer to the edge devices, enabling faster processing, lower latency, and improved efficiency in IoT systems.

Day 17: 6th October 2022

Session 33: (9:30 AM to 11:30 AM) Real-time Monitoring and Control of IoT Systems by Dr. Raghavendra, Associate Professor, Manipal Institute of Technology:

Explore techniques and technologies for real-time monitoring and control of IoT devices and systems, enabling timely responses and decision-making based on live data.

Session 34: (2:00 PM to 3:30 PM) IoT Data Management and Storage Solutions by Dr. R. CH. A Naidu, HOD Dept of CSE, TOCE:

Discuss strategies for managing and storing the massive amounts of data generated by IoT devices, including data aggregation, compression, data lakes, and scalable storage solutions.

Day 18: 7th October 2022

Session 35: (9:30 AM to 11:30 AM) IoT-based Environmental Monitoring and Sustainability by Dr. Buddesab, Assistant Professor, TOCE:

Examine how IoT can be used for environmental monitoring, pollution detection, and sustainable resource management, fostering a greener and more sustainable future.

Session 36: (2:00 PM to 3:30PM) Human-Computer Interaction in IoT by Dr. Srinidhi, Associate Professor, REVA University:

Discuss user interface design, interaction models, and user experience considerations for IoT systems, focusing on enhancing the interaction between humans and connected devices.

Day19: 8th October2022

Session 37: (9:30 AM to 11:30AM) Wearable Devices and IoT by Dr. C Geetha Mara, REVA University:

Enhancing Personal Healthcare: Investigate the role of wearable devices in healthcare, including remote patient monitoring, real-time health tracking, and personalized healthcare delivery enabled by IoT technologies.

Session 38:(2:00 PMto 3:30PM)IoT in Supply Chain Management and Logistics by Dr. Ramesh, Associate Professor, ALVAS Engineering College:

Examine the application of IoT in supply chain management, logistics, and inventory tracking, optimizing efficiency, reducing costs, and improving overall supply chain visibility.

Day20: 10th October2022

Session39:(9:30AM to11:30AM)Industrial IoT and Industry 4.0 by Dr. Jeevitha B K, Associate Professor, VKIT:

Revolutionizing Manufacturing Processes: Discuss the integration of IoT devices, automation, and data analytics in industrial settings, enabling smart manufacturing, predictive maintenance, and improved productivity.

Session 40: (2:00 PM to 3:30PM) Valedictory Function:

In valedictory session, number of participants was approximately 20 along with Principal of the oxford college of Engineering, Bangalore. Many participants have given the feedback and suggestions for the speakers and overall FDP.

Outcome:

Exploring the topics related to advances in IoT can have a profound impact on various aspects of our lives and industries. By delving into areas such as blockchain for secure IoT networks, fog computing, and machine learning for anomaly detection, participants can acquire the knowledge and skills to enhance security, improve system efficiency, and detect potential threats in real-time. Understanding IoT data management, environmental monitoring, and energy management enables participants to make informed decisions, optimize resource utilization, and contribute to

sustainability efforts. Moreover, topics like personalized healthcare, smart retail, and industrial automation foster innovation, improve customer experiences, and drive productivity. Through these outcomes, participants can gain insights into cutting-edge technologies and their applications, empowering them to navigate the rapidly evolving IoT landscape with confidence and harness its potential for positive change.



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