REPORT

on

Online FDP

:

"Microfluidic Devices: Tools, Fabrication Techniques, and Emerging Applications"

Date **: 22nd August, 2025**

Centurion UNIVERSITY

Shaping Lives...
Empowering Communities...

Organized by

Center for Smart Engineering Applications
&
Department of ECE

School of Engineering and Technology, Bhubaneswar

Centurion University of Technology and Management, Odisha, India

Introduction :

The **Center for Smart Engineering Applications**, in collaboration with the Department of **Electronics and Communication Engineering** (**ECE**), School of Engineering and Technology (**SoET**), Centurion University of Technology and Management (**CUTM**), Bhubaneswar Campus, successfully organized a Faculty Development Program (**FDP**) on **22nd August 2025**. The program was coordinated by **Dr. Swarna Prabha Jena**, Assistant Professor, Department of ECE, whose efforts ensured effective planning, outreach, and smooth execution of the session.

The **FDP** was conducted online via **Zoom** and featured **Dr. Harika Dechiraju**, Postdoctoral Researcher at Lawrence Berkeley National Laboratory, Berkeley, USA, as the distinguished resource person.

The session drew faculty members, research scholars, and students from diverse disciplines including **Pharmacy**, **Biotechnology**, **Biosciences**, and **Biomedical Engineering**, creating a multidisciplinary platform for knowledge exchange.

Objectives :

- **To familiarize participants with tools, fabrication techniques, and applications of microfluidic devices.**
- **To highlight the role of microfluidics in disease diagnosis, drug discovery, and biomedical research.**
- **To expose faculty and scholars to advanced methods like 3D printing, photolithography, and droplet microfluidics.**
- **To promote interdisciplinary learning across engineering, pharmacy, biosciences, and biotechnology.**
- **To encourage awareness of regulatory and translational challenges in microfluidic technology.**

Key Activities :

The **FDP** session commenced at **10:00 AM IST** with a warm welcome address delivered by **Dr. Swarna Prabha Jena**, Assistant Professor, Department of ECE, who also served as the event coordinator. In her address, she extended greetings to all participants and emphasized the importance of the topic for interdisciplinary research and innovation.

Following the welcome, **Dr. Harika Dechiraju** delivered a comprehensive lecture on the fundamentals and applications of microfluidic devices. She elaborated on their role in **disease diagnosis**, **drug discovery**, **tissue engineering**, **organ-on-a-chip**, **biosensing**, and **point-of-care testing**. Advanced fabrication methods such as photolithography, high-throughput screening, 3D printing, patterning, and droplet microfluidics were also explained with clarity. Interactive discussions highlighted her pioneering research on automated tumor-on-chip systems and organoid growth studies, demonstrating the potential of microfluidics in biomedical innovation.

Dr. Swarna Prabha , in her coordinating role, ensured seamless technical facilitation, active participation, and smooth conduction of the FDP until its conclusion, which ended with a fruitful Q&A session.

Key Highlights :

- **Expert Lecture:** Delivered by Dr. Harika Dechiraju, Lawrence Berkeley National Laboratory, USA.
- **Cutting-Edge Applications:** Focused on healthcare, diagnostics, and biomedical engineering.
- **Advanced Fabrication Techniques:** Included 3D printing, photolithography, and droplet microfluidics.
- **Research Integration:** Insights into organ-on-a-chip and tumor-on-chip systems.
- **Interdisciplinary Participation:** Faculty and students from Pharmacy, Biotechnology, Biosciences, and Engineering.

Key Outcomes :

- **Knowledge Enhancement:** Participants gained deeper understanding of microfluidic tools and applications.
- **Research Orientation:** Exposure to interdisciplinary methods linking engineering with biosciences.
- **Skill Development:** Awareness of advanced fabrication and testing techniques.
- **Critical Awareness:** Recognition of regulatory barriers in clinical adoption.
- **Academic Growth:** Strengthened prospects for collaborative research and innovation.

Future Scope :

The **FDP** opened new avenues for organizing regular workshops and research discussions on microfluidics at **CUTM**. Future sessions may focus on advanced modules such as **lab-on-a-chip systems**, **biosensor integration**, and **commercialization strategies**. Establishing collaborations with global research institutions could also help in providing certification-based training and advanced research internships. Integrating microfluidics into project-based learning across biosciences and engineering curricula will further reinforce industry-relevant knowledge and research competence at **CUTM**.

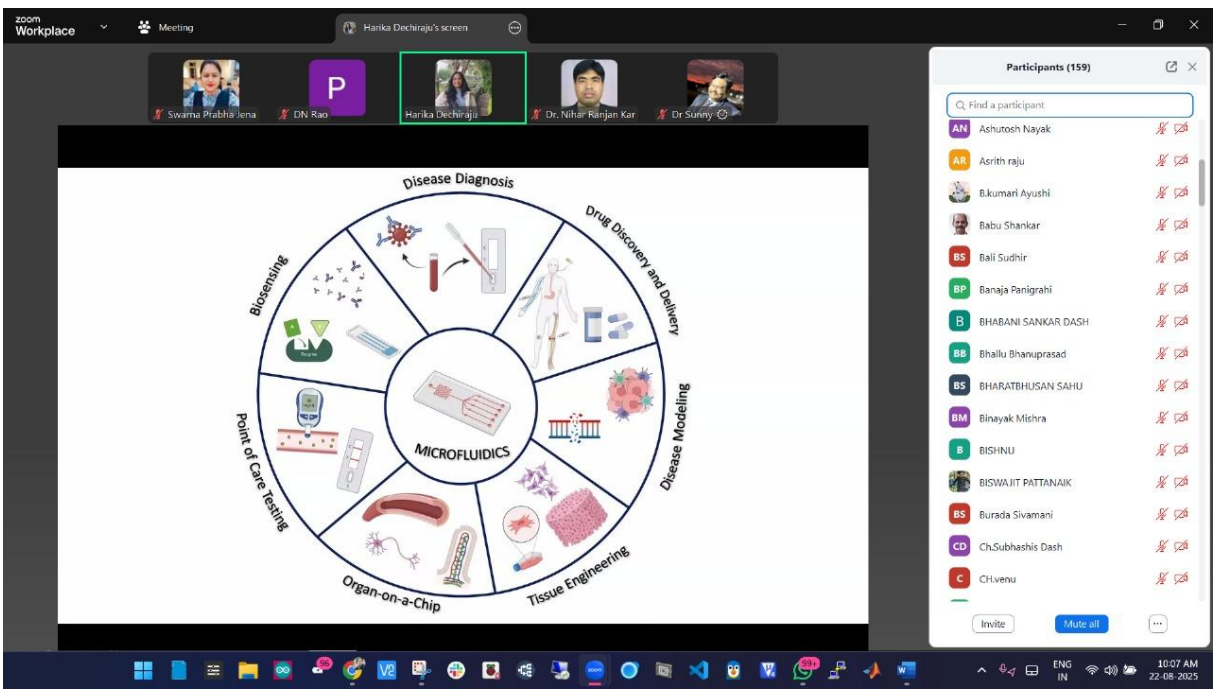
Feedback from Participants:

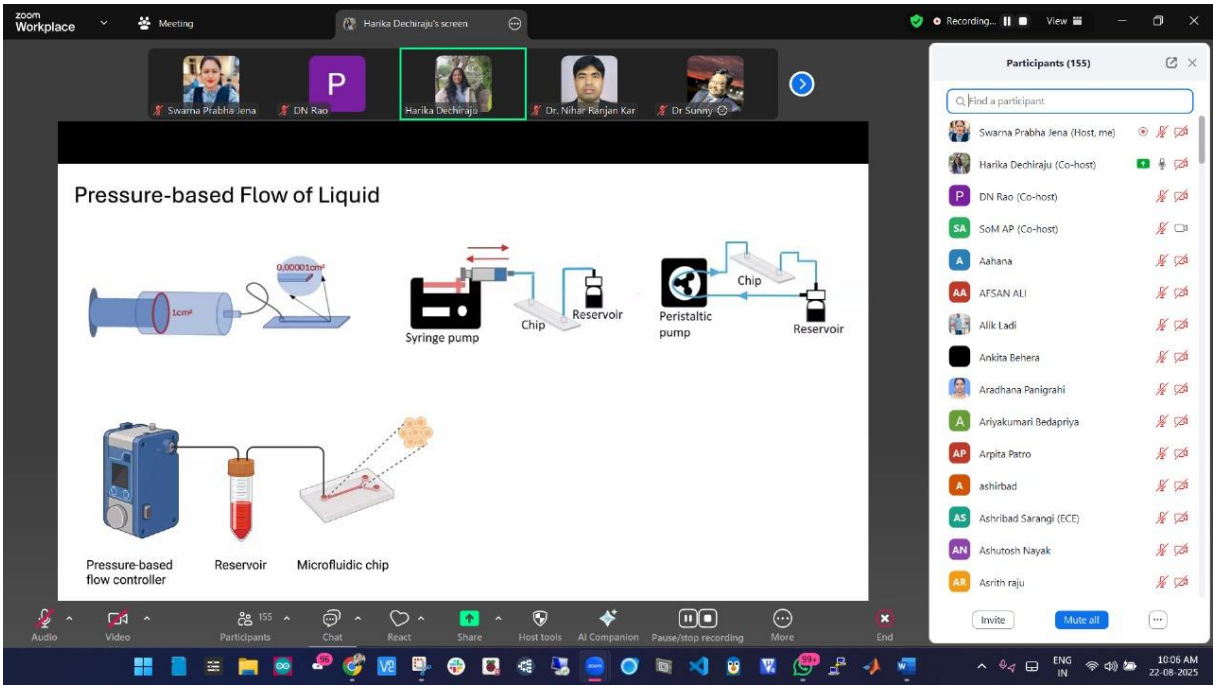
Participants expressed appreciation for the **clarity** and **depth** of the **session**. They found the case studies on tumor-on-chip and organoid growth particularly inspiring and relevant to ongoing biomedical challenges. The emphasis on both technical and regulatory aspects was valued for providing a realistic view of translational hurdles. Many requested follow-up sessions or **advanced FDPs** focusing on **hands-on experimentation**, **collaborative research** opportunities, and **exposure to** emerging trends in **biosciences and engineering**. Overall, the feedback reflected a strong interest in expanding interdisciplinary engagement.

Acknowledgements :

We extend our sincere gratitude to the School of Engineering and Technology (**SoET**), CUTM Bhubaneswar Campus, for their support in hosting this **FDP**. Special thanks to **Dr. Harika Dechiraju** for sharing her expertise and delivering an enlightening session on microfluidic devices and their biomedical applications. We also acknowledge the commendable role of **Dr. Swarna Prabha Jena**, Assistant Professor, Department of ECE, who served as the **coordinator**, delivered the welcome speech, and took responsibility for conducting the **FDP** smoothly, ensuring its overall success. We also appreciate the active participation of **faculty members**, **research scholars**, and **students** from diverse schools whose engagement contributed to the event's impact. Finally, we thank the **technical coordinators** for their assistance in ensuring smooth online execution.

Glimpses of the Event :




zoom Workplace
Meeting
Harika Dechiraju's screen
Recording...
View
Swarna Prabha Jena
DN Rao
Harika Dechiraju
Dr. Nihar Ranjan Kar
Dr Sunny
Pressure-based Flow of Liquid
0.00001cm²
1cm²
Syringe pump
Chip
Reservoir
Peristaltic pump
Chip
Reservoir
Pressure-based flow controller
Reservoir
Microfluidic chip
Participants (155)
Find a participant
Swarna Prabha Jena (Host, me)
Harika Dechiraju (Co-host)
DN Rao (Co-host)
SoM AP (Co-host)
Aahana
AFSAN ALI
Alik Ladi
Ankita Behera
Aradhana Panigrahi
Ariyakumari Bedapriya
Arpita Patro
ashirbad
Ashribad Sarangi (ECE)
Ashutosh Nayak
Asrith raju
Invite
Mute all
Audio
Video
Participants
Chat
React
Share
Host tools
AI Companion
Pause/stop recording
More
End
ENG IN
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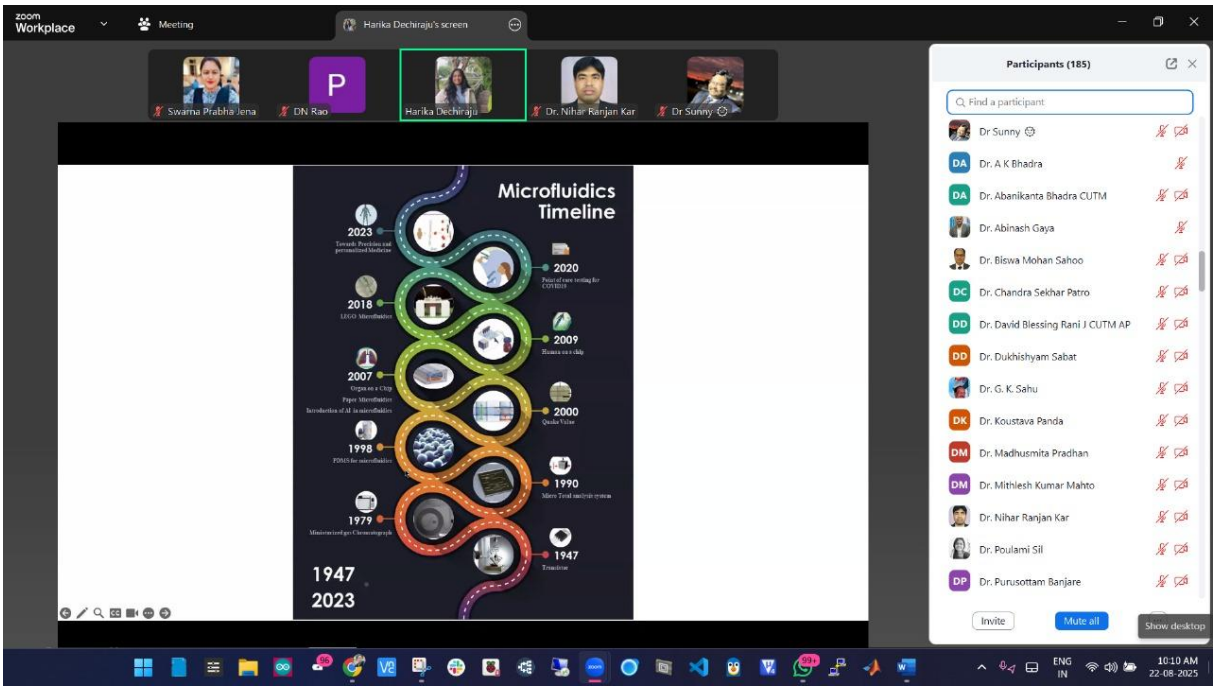
22-08-2025


zoom Workplace
Meeting
Harika Dechiraju's screen
Swarna Prabha Jena
DN Rao
Harika Dechiraju
Dr. Nihar Ranjan Kar
Dr Sunny
Microfluidics Timeline
2023
2020
2018
2009
2007
2000
1998
1990
1979
1947
1947
2023
Participants (185)
Find a participant
Dr Sunny
Dr. A K Bhadra
Dr. Abanikanta Bhadra CUTM
Dr. Abinash Gaya
Dr. Biswa Mohan Sahoo
Dr. Chandra Sekhar Patro
Dr. David Blessing Rani J CUTM AP
Dr. Dukhishyam Sabat
Dr. G. K. Sahu
Dr. Koustava Panda
Dr. Madhusmita Pradhan
Dr. Mithlesh Kumar Mahto
Dr. Nihar Ranjan Kar
Dr. Poulami Sil
Dr. Purusottam Banjare
Invite
Mute all
Show desktop
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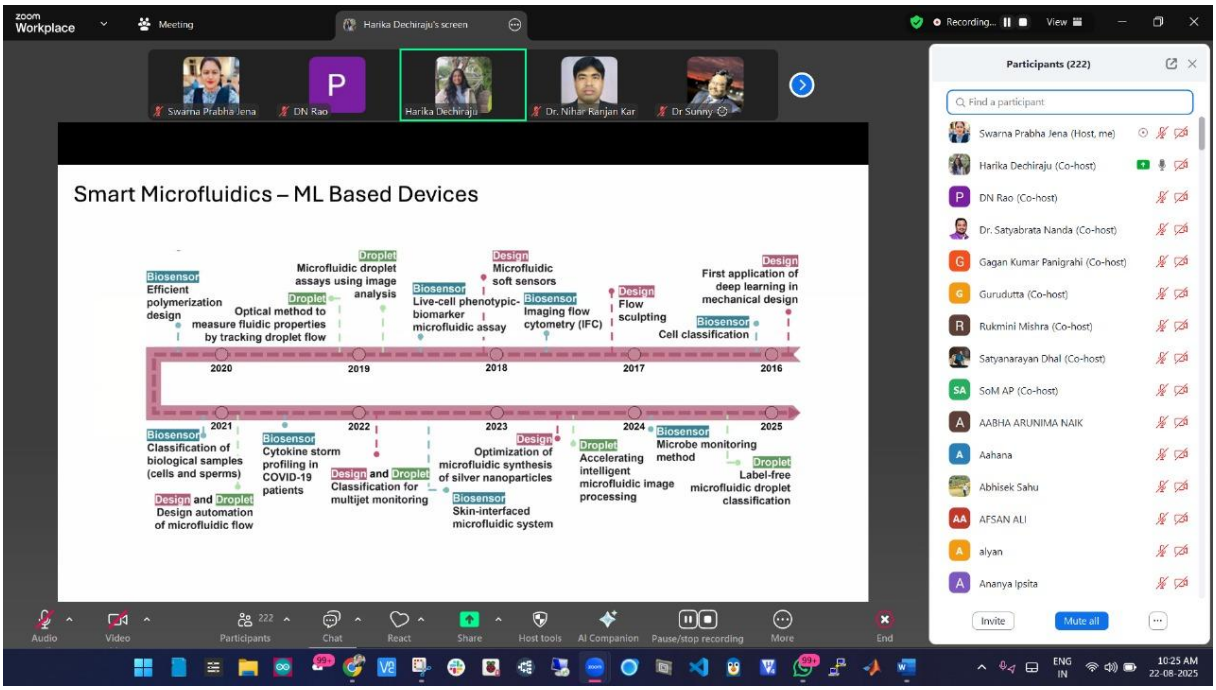
zoom Workplace
Meeting
Harika Dechiraju's screen
Recording...
View
Swarna Prabha Jena
DN Rao
Harika Dechiraju
Dr. Nihar Ranjan Kar
Dr Sunny
Smart Microfluidics – ML Based Devices
Biosensor Efficient polymerization design
Droplet Optical method to measure fluidic properties by tracking droplet flow
Droplet Microfluidic droplet assays using image analysis
Biosensor Live-cell phenotypic-biomarker microfluidic assay
Design Microfluidic soft sensors
Biosensor Imaging flow cytometry (IFC)
Design Flow sculpting
Biosensor Cell classification
Design First application of deep learning in mechanical design
2020
2019
2018
2017
2016
2021
2022
2023
2024
2025
Biosensor Classification of biological samples (cells and sperms)
Design and Droplet Design automation of microfluidic flow
Biosensor Cytokine storm profiling in COVID-19 patients
Design and Droplet Classification for multijet monitoring
Design Optimization of microfluidic synthesis of silver nanoparticles
Biosensor Skin-interfaced microfluidic system
Droplet Accelerating intelligent microfluidic image processing
Biosensor Microbe monitoring method
Droplet Label-free microfluidic droplet classification
Participants (222)
Find a participant
Swarna Prabha Jena (Host, me)
Harika Dechiraju (Co-host)
DN Rao (Co-host)
Dr. Satyabrata Nanda (Co-host)
Gagan Kumar Panigrahi (Co-host)
Gurudutta (Co-host)
Rukmini Mishra (Co-host)
Satyanarayan Dhal (Co-host)
SoM AP (Co-host)
AABHA ARUNIMA NAIK
Aahana
Abhisek Sahu
AFSAN ALI
alyan
Ananya Ipsita
Invite
Mute all
Audio
Video
Participants
Chat
React
Share
Host tools
AI Companion
Pause/stop recording
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End
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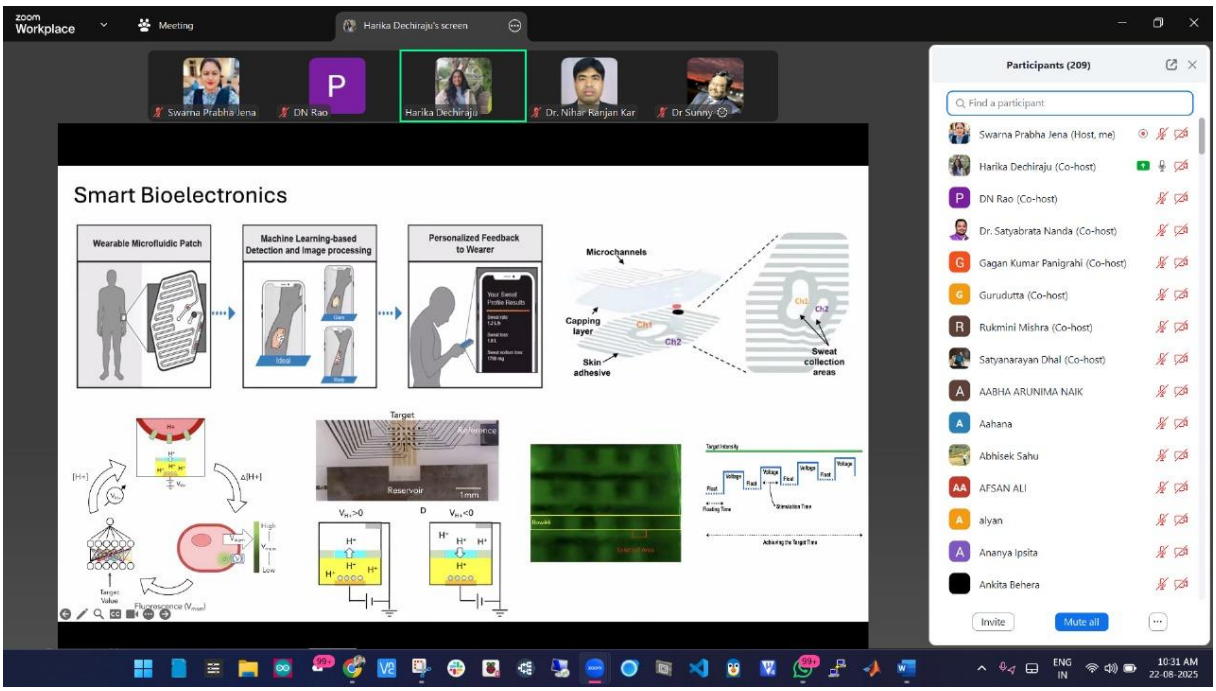
zoom Workplace
Meeting
Harika Dechiraju's screen
Swarna Prabha Jena
DN Rao
Harika Dechiraju
Dr. Nihar Ranjan Kar
Dr Sunny
Smart Bioelectronics
Wearable Microfluidic Patch
Machine Learning-based Detection and Image processing
Personalized Feedback to Wearer
Microchannels
Capping layer
Skin adhesive
Sweat collection areas
Target
Reference
Reservoir
1mm
Participants (209)
Find a participant
Swarna Prabha Jena (Host, me)
Harika Dechiraju (Co-host)
DN Rao (Co-host)
Dr. Satyabrata Nanda (Co-host)
Gagan Kumar Panigrahi (Co-host)
Gurudutta (Co-host)
Rukmini Mishra (Co-host)
Satyanarayan Dhal (Co-host)
AABHA ARUNIMA NAIK
Aahana
Abhisek Sahu
AFSAN ALI
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Ananya Ipsita
Ankita Behera
Invite
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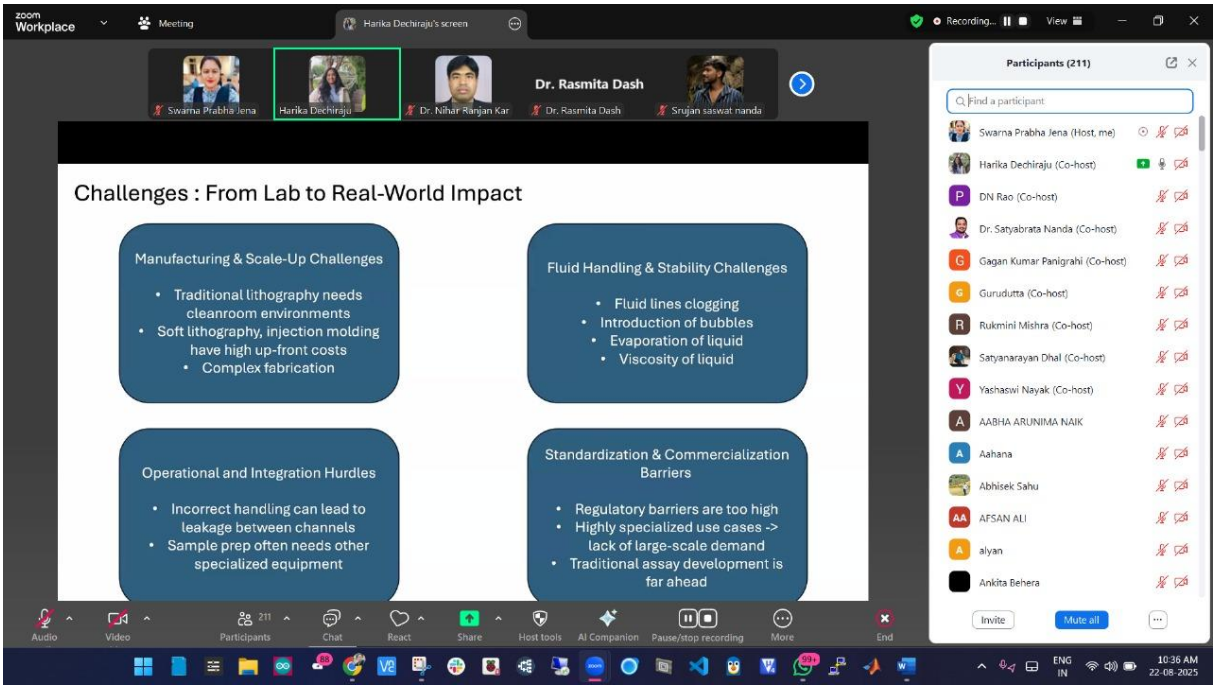
Meeting
Harika Dechiraju's screen
Recording...
View
Swarna Prabha Jena
Harika Dechiraju
Dr. Nihar Ranjan Kar
Dr. Rasmita Dash
Srujan saswat nanda
Challenges : From Lab to Real-World Impact
Manufacturing & Scale-Up Challenges
Traditional lithography needs cleanroom environments
Soft lithography, injection molding have high up-front costs
Complex fabrication
Fluid Handling & Stability Challenges
Fluid lines clogging
Introduction of bubbles
Evaporation of liquid
Viscosity of liquid
Operational and Integration Hurdles
Incorrect handling can lead to leakage between channels
Sample prep often needs other specialized equipment
Standardization & Commercialization Barriers
Regulatory barriers are too high
Highly specialized use cases -> lack of large-scale demand
Traditional assay development is far ahead
Participants (211)
Find a participant
Swarna Prabha Jena (Host, me)
Harika Dechiraju (Co-host)
DN Rao (Co-host)
Dr. Satyabrata Nanda (Co-host)
Gagan Kumar Panigrahi (Co-host)
Gurudutta (Co-host)
Rukmini Mishra (Co-host)
Satyanarayan Dhal (Co-host)
Yashaswi Nayak (Co-host)
AABHA ARUNIMA NAIK
Aahana
Abhisek Sahu
AFSAN ALI
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Invite
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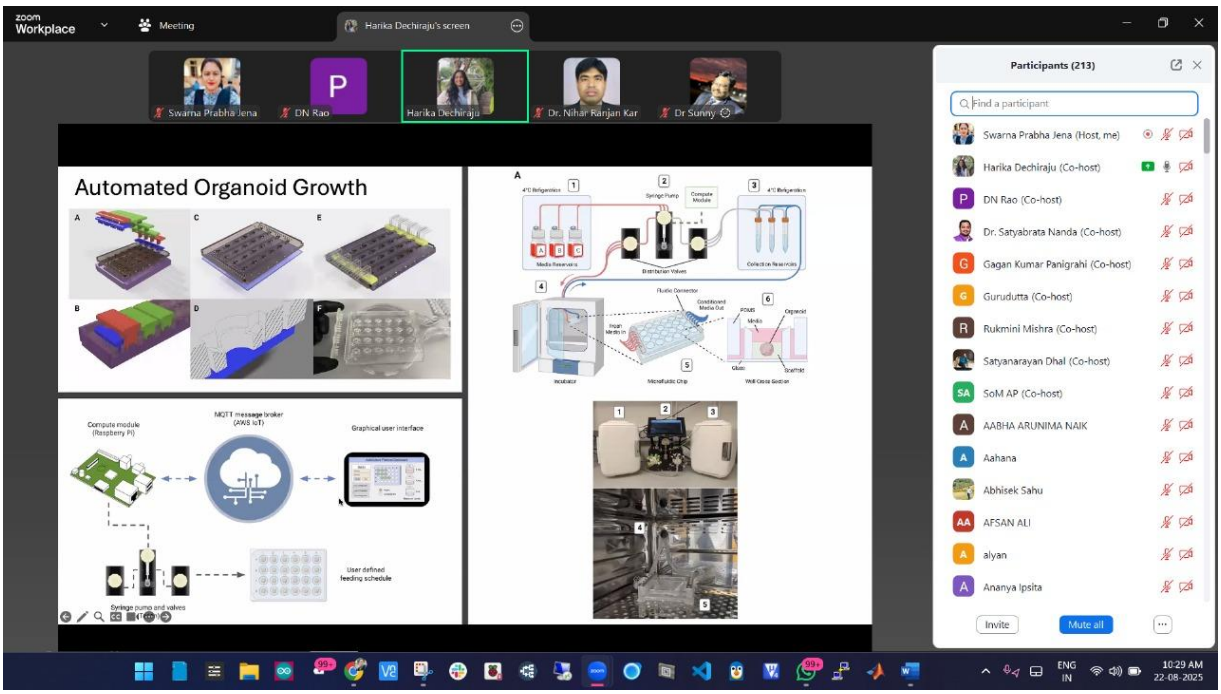
Meeting
Harika Dechiraju's screen
Swarna Prabha Jena
DN Rao
Harika Dechiraju
Dr. Nihar Ranjan Kar
Dr Sunny
Automated Organoid Growth
Compute module (Raspberry Pi)
MQTT message broker (AWS IoT)
Graphical user interface
User defined feeding schedule
Syringe pump and valves
Participants (213)
Find a participant
Swarna Prabha Jena (Host, me)
Harika Dechiraju (Co-host)
DN Rao (Co-host)
Dr. Satyabrata Nanda (Co-host)
Gagan Kumar Panigrahi (Co-host)
Gurudutta (Co-host)
Rukmini Mishra (Co-host)
Satyanarayan Dhal (Co-host)
SoM AP (Co-host)
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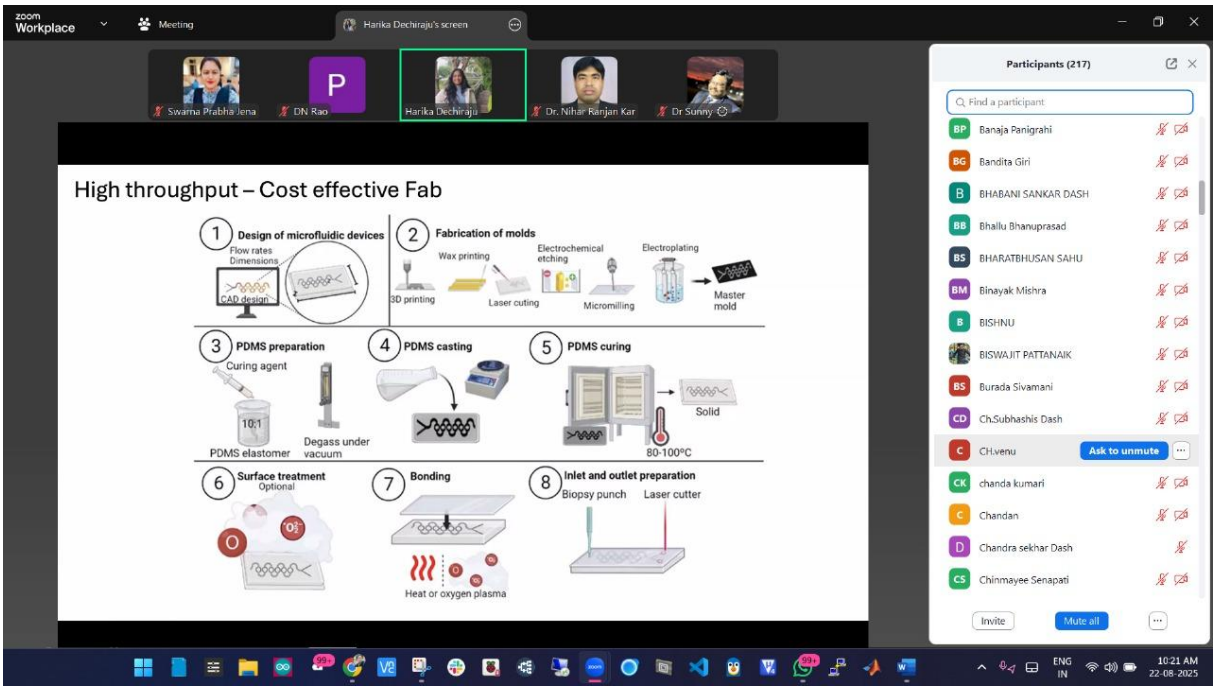
zoom Workplace
Meeting
Harika Dechiraju's screen
Swarna Prabha Jena
DN Rao
Harika Dechiraju
Dr. Nihar Ranjan Kar
Dr Sunny
High throughput – Cost effective Fab
1 Design of microfluidic devices
Flow rates
Dimensions
CAD design
2 Fabrication of molds
Wax printing
Electrochemical etching
Electroplating
3D printing
Laser cuting
Micromilling
Master mold
3 PDMS preparation
Curing agent
10:1
PDMS elastomer
Degass under vacuum
4 PDMS casting
5 PDMS curing
Solid
80-100°C
6 Surface treatment
Optional
7 Bonding
Heat or oxygen plasma
8 Inlet and outlet preparation
Biopsy punch
Laser cutter
Participants (217)
Find a participant
Banaja Panigrahi
Bandita Giri
BHABANI SANKAR DASH
Bhallu Bhanuprasad
BHARATBHUSAN SAHU
Binayak Mishra
BISHNU
BISWAJIT PATTANAIK
Burada Sivamani
Ch.Subhashis Dash
CH.venu
Ask to unmute
chanda kumari
Chandan
Chandra sekhar Dash
Chinmayee Senapati
Invite
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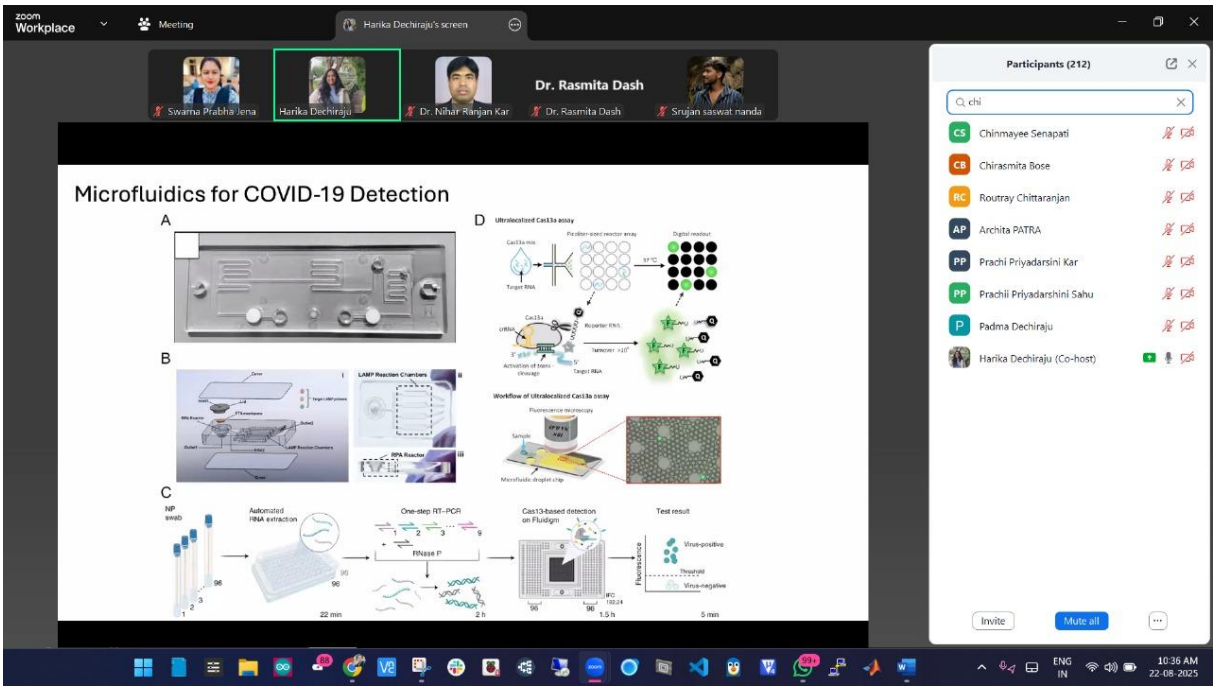
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Meeting
Harika Dechiraju's screen
Swarna Prabha Jena
Harika Dechiraju
Dr. Nihar Ranjan Kar
Dr. Rasmita Dash
Srujan saswat nanda
Microfluidics for COVID-19 Detection
A
B
C
D
Ultralocalized Cas13a assay
Workflow of Ultralocalized Cas13a assay
NP swab
Automated RNA extraction
One-step RT–PCR
RNase P
Cas13-based detection on Fluidigm
Test result
Virus-positive
Virus-negative
Threshold
Fluorescence
22 min
2 h
1.5 h
5 min
Participants (212)
chi
Chinmayee Senapati
Chirasmita Bose
Routray Chittaranjan
Archita PATRA
Prachi Priyadarsini Kar
Prachii Priyadarshini Sahu
Padma Dechiraju
Harika Dechiraju (Co-host)
Invite
Mute all
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