

## **Boiling Heat Transfer: From Fundamentals to Surface Innovations**

A one-hour online technical talk entitled “Boiling Heat Transfer: From Fundamentals to Surface Innovations” was organized by the department on 26th November, 2025 from 1:20 PM to 2:30 PM as part of its academic enrichment and faculty–student development activities. The objective of the session was to strengthen conceptual understanding of boiling heat transfer mechanisms, covering fundamental aspects such as nucleate boiling, bubble dynamics, heat transfer regimes, and critical heat flux, while also introducing recent advancements in surface engineering for boiling heat transfer enhancement. The talk emphasized the role of surface modifications, including micro- and nano-structured surfaces, wettability control, and coatings, in improving thermal performance in contemporary engineering applications.

The session was designed to bridge theoretical foundations with current research trends, thereby contributing to outcome-based education and research awareness among faculty members, research scholars, and students. The online format enabled effective participation and interaction within the stipulated one-hour duration. The activity supported continuous professional development and alignment with NBA/NAAC quality benchmarks related to academic initiatives, research orientation, and student–faculty engagement. The list of registered participants, pamphlet of the talk, and snapshots of the online session are attached below.



HARCOURT BUTLER TECHNICAL UNIVERSITY  
Department of Mechanical Engineering

*Presents*

Session on

# BOILING HEAT TRANSFER

From Fundamentals to  
Surface Innovations



26 November 2025  
01:20 PM - 2:30 PM



Scan to Register

Organizers

*Dr. Gaurav Saini*

*Dr. Rohit Kumar*

**Dr. Rajesh Kumar**

*Post-Doctoral Researcher, IIT Delhi*



RAJESH KUMAR (Presenting)

### Pool boiling regimes and bubble morphology

Onset of boiling    Isolated bubble regime    Regime of slugs and bubbles    After CHF (Film boiling regime)

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1:28 PM | Expert lecture on the topic: "...

77

rohit.k kumar

RAJESH KUMAR

74 others

RAJESH KUMAR (Presenting)

### Pool boiling regimes and bubble morphology

Onset of boiling    Isolated bubble regime    Regime of slugs and bubbles    After CHF (Film boiling regime)

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1:25 PM | Expert lecture on the topic: "...

78

rohit.k kumar

RAJESH KUMAR

75 others

RAJESH KUMAR (Presenting)

### Heat transfer mechanism and enhancement methods

**Bubble ebullition cycle**

- Heat dissipation in many electronic devices has begun to cross  $1000 \text{ kW/m}^2$ .
- To develop more compact, reliable and energy-efficient heat exchangers.

**Pool boiling heat transfer enhancement Techniques:**

- Active techniques**
  - Ultrasonic vibration
  - Electrostatic/ Magnetic fields
  - Surface vibration
  - External flow
- Passive techniques**
  - Heater surface modification:
    - Micro/Nanostructuring
    - Surface coatings
    - Wettability/conductivity modification
  - Boiling fluid modification:
    - Use of additives such as surfactants or nanoparticles

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1:31 PM | Expert lecture on the topic: "...

83

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### Literature : surface wettability or conductivity variation

**Hydrophilic Network (+)**  
 $d = 40 \mu\text{m}$   
 $p = 100 \mu\text{m}$

**Hydrophobic Network (-)**

**Superhydrophobic** (a) 13.63 mm, (b) 2.72 mm, (c) 0.85 mm, (d) 0.21 mm  
**Hydrophilic**

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1:36 PM | Expert lecture on the topic: "...

80

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### Schematic of pool boiling experimental facility

1:38 PM | Expert lecture on the topic: "...

76

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### TRM and STRM structured surfaces

1:57 PM | Expert lecture on the topic: "...

59

RAJESH KUMAR (Presenting)

### Wall jet flow boiling configuration and plain surface heat transfer performance

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