Department of Mechanical Engineering

A.Y 2025-2026, Even Semester

Academic Guest Lecture Report

In view of the department activities, the Department of Mechanical Engineering organized an **Academic Guest Lecture** by **Dr. K. S. S. Harish**, Assistant Professor, Department of Mechanical Engineering, **National Institute of Technology Tiruchirappalli**, on **17-02-2026** under the **Energy & CFD cohort**. He delivered the lecture from 11:30 A.M. to 12:30 P.M. on the topic "**Fluid Kinetics: Different Aspects of Fluid Motion**." The session was conducted in online mode through the Google Meet platform. A total of 107 participants (97 students and 10 faculty members) from the Department of Mechanical Engineering attended the session in blended mode.

Google meet Link: https://meet.google.com/tbe-whqc-imu

The lecture was delivered by Dr. K.S.S. Harish, Assistant Professor, Department of Mechanical Engineering, National Institute of Technology Tiruchirappalli. The session aimed to strengthen students understanding of fluid mechanics concepts and their practical applications in engineering.

Dr. Harish began the lecture by explaining the fundamentals of fluid kinetics and the importance of studying fluid motion in various engineering fields. He clearly differentiated between fluid statics and fluid kinetics and emphasized the significance of analyzing fluid motion in real-world systems such as pipelines, turbines, pumps, and aerodynamic structures.

Fluid kinetics deals with the study of motion of fluid particles and the changes that occur when velocity varies with position and time. To understand fluid motion clearly, we consider a very small fluid element in the XY plane and analyze how it behaves when the velocity components in the X-direction (u) and Y-direction (v) change from point to point. When the velocity is uniform and does not vary with position, the fluid element undergoes pure translation. In this case, the entire element moves from one location to another without

any change in its shape, size, or orientation. There is no deformation or rotation; the motion is simply linear displacement.

However, when the velocity varies with respect to X or Y coordinates, the fluid element experiences deformation. Linear or normal deformation occurs when there is a

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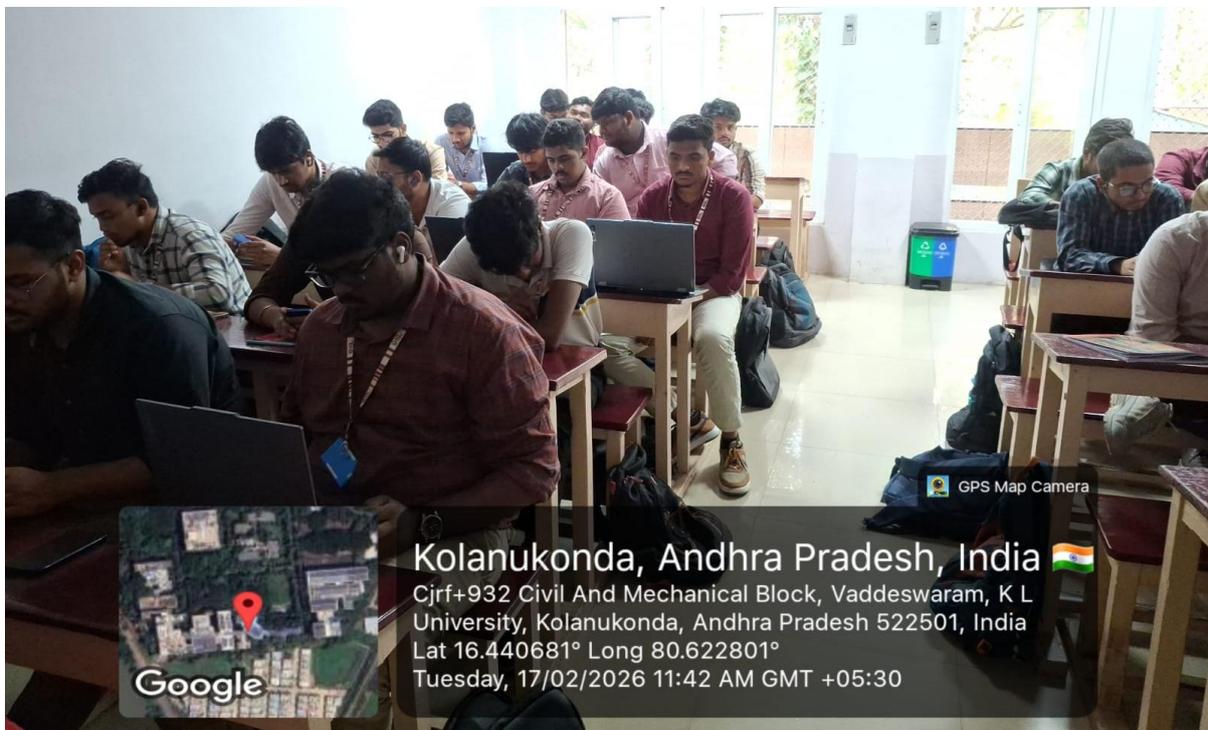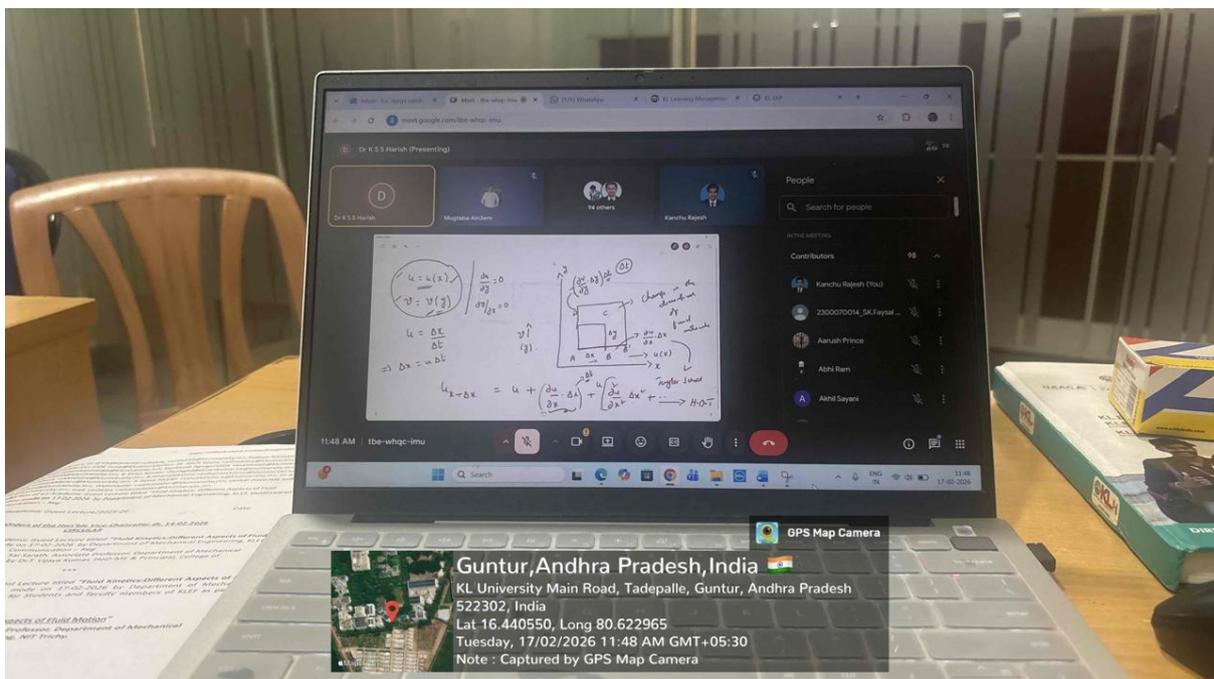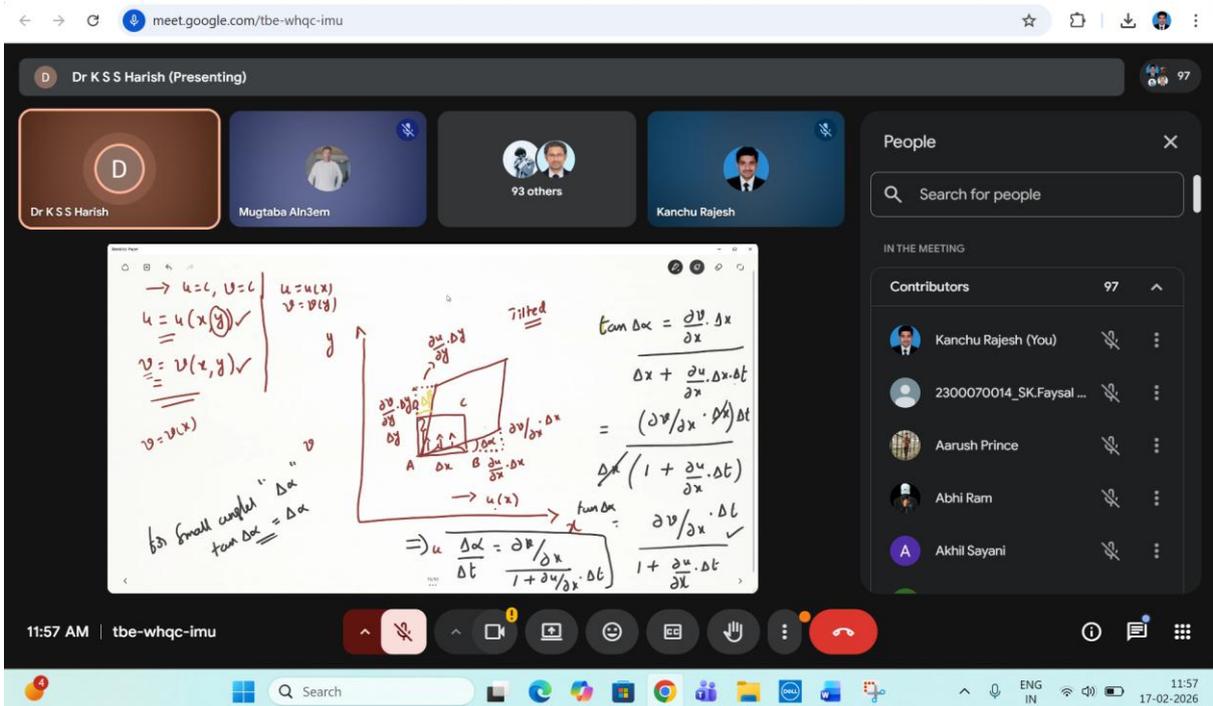(Deemed to be University estd. u/s. 3 of the UGC Act, 1956)
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change in velocity along the same direction, such as variation of u with respect to x or v with respect to y. This results in stretching or compression of the fluid element along that direction. If the sum of the velocity gradients ($\partial u/\partial x + \partial v/\partial y$) is non-zero, the volume of the element changes; if it is zero, the flow is incompressible and volume remains constant. In addition to linear deformation, shear deformation occurs when there is velocity variation perpendicular to the direction of motion, such as $\partial u/\partial y$ or $\partial v/\partial x$. In this case, the originally square fluid element changes its shape into a rhombus, indicating angular distortion without necessarily changing its volume.

Another important aspect of fluid motion is angular rotation. When there is an imbalance between $\partial v/\partial x$ and $\partial u/\partial y$, the fluid element rotates about its own axis. This rotation is associated with vorticity. If the rotation component is zero, the flow is called irrotational; if it is non-zero, the flow is rotational. In pure rigid body rotation, the fluid element rotates without any change in shape or volume.

He explained the concepts with simple examples and practical case studies, enabling students to connect theoretical knowledge with real-time industrial applications.
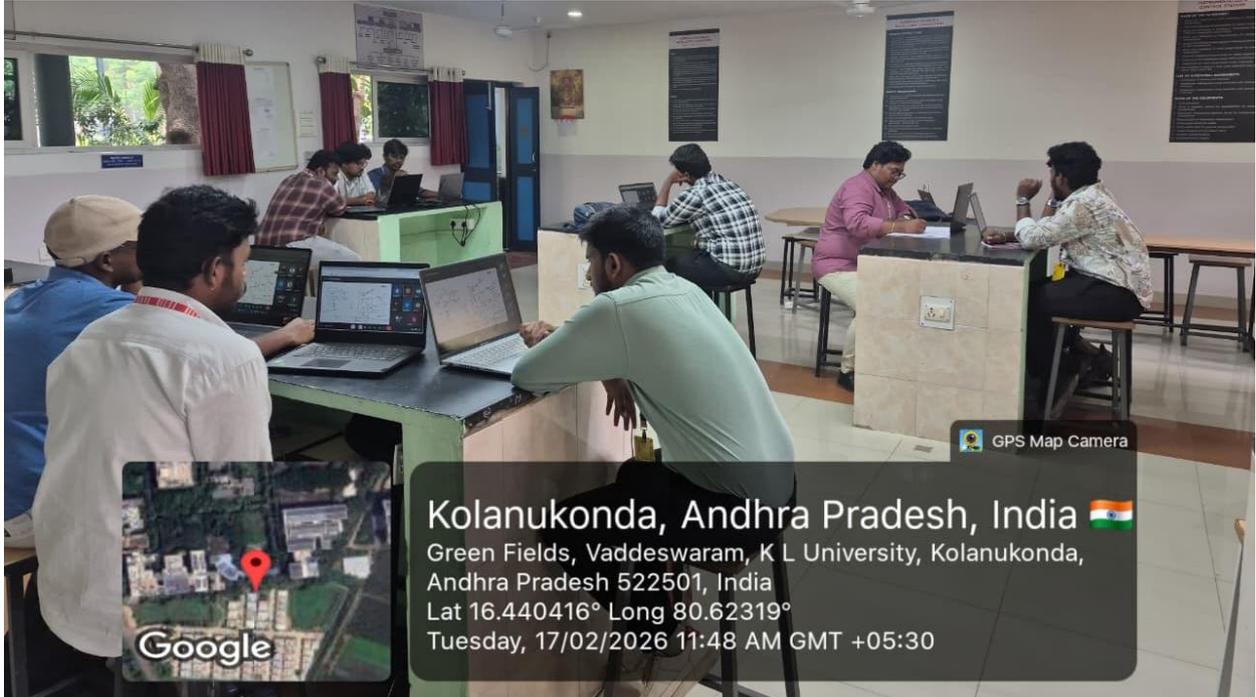
Several special cases arise from these conditions. In pure translation, all velocity gradients are zero and there is no deformation or rotation. In pure linear deformation, stretching or compression occurs without rotation. In pure shear deformation, the shape changes but there is no rigid body rotation. In pure rotation, the element spins without

distortion. In incompressible flow, the volume remains constant even though shape and orientation may change.

Thus, the motion of a fluid element in the XY plane is generally a combination of translation, deformation (linear and shear), and angular rotation. Understanding these aspects helps in analyzing real engineering flows such as pipe flow, boundary layer development, vortex motion, and aerodynamic flow fields.

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Dr. Harish also highlighted the relevance of fluid kinetics in advanced research areas such as computational fluid dynamics, aerospace engineering, and thermal systems. He encouraged students to focus on fundamental concepts and develop analytical skills for higher studies and research opportunities.

The session was highly informative and beneficial for the students. It enhanced their conceptual clarity and provided exposure to advanced applications of fluid mechanics. The lecture concluded with an interactive question-and-answer session, where Dr. Harish addressed students queries patiently and effectively.

Overall, the academic guest lecture was added significant academic value to the learning experience of B.Tech Mechanical Engineering students at KLEF. At last Dr. K. V. Durga Rajesh, Alternate Head of the Department delivered Vote of Thanks to the resource person.

Prepared by   **Approved by**

(Dr. K. Sai Sarath)   **(Dr. T. Vijaya Kumar)**