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Registration Seminar

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| Seminar Title | : Dynamic Characteristics of Underwater Pipelines Conveying Fluids  |
| Speaker       | : Siddharth Panda ( Rollno : 523me1003)   |
| Supervisor    | : Rabindra Kumar Behera   |
| Venue         | : Seminar Hall (Mechanical Engineering)   |
| Date and Time | : 23 Apr 2025 (04:00 PM)  |
| Abstract      | : Underwater pipelines play a vital role in transporting oil and gas under challenging marine conditions, where they are exposed to strong currents, internal fluid forces, and structural vibrations. This study presents an analytical investigation into the vibration behavior and stability of pipelines conveying fluid, based on Euler&ndashBernoulli beam theory with pinned-pinned boundary conditions. A fourth-order differential equation is derived and solved to obtain closed-form expressions for the pipeline&rsquo;s natural frequencies and mode shapes. The results show that as internal fluid velocity increases, the natural frequency of the pipeline decreases, making it more prone to resonance and dynamic instability. Critical flow velocities are identified for different vibration modes, indicating the point at which the pipeline may become unstable due to flutter. A sensitivity analysis is performed to evaluate the effects of key physical parameters such as pipe length, wall thickness, and material stiffness. It is observed that longer pipes tend to vibrate at lower frequencies, while thicker and stiffer pipes improve stability. Interestingly, the mode shapes remain unchanged regardless of these parameters and are governed mainly by the boundary conditions. This study provides valuable insights into how fluid-structure interactions and design variables influence the vibration behavior of Underwater pipelines, helping to ensure safer and more reliable operation in real-world environments. |