National Institute of Technology Rourkela

Synopsis Seminar

Seminar Title	: Dynamic analysis of seismically excited sloped wall tanks and tuned liquid dampers for structural vibration control
Speaker	: Sidhartha Sankar Roy (Rollno : 519ce1010)
Supervisor	: Prof. Kishore Chandra Biswal
Venue	: Departmental Seminar Hall (MN-238)
Date and Time	: 27 Nov 2024 (10.30am)
Abstract	: In structural engineering, seismic excitation induces severe sloshing-induced hydrodynamic force, which significantly affects the safety and serviceability of elevated and ground-supported liquid storage tanks. Hence, investigation of the liquid slosh dynamics under periodic as well as random excitations becomes essential. Along with the tank geometry, factors like the external excitation's amplitude and frequency content, and the presence of the internal object significantly impact the hydrodynamic response of the liquid containers. In the present investigation, liquid sloshing is simulated using both linear and non-linear 2D finite element models (FEMs) developed employing the potential flow theory. The linear and non-linear seismic response of a sloped wall tank is suitably investigated under different earthquakes. Utilizing the inherent energy dissipation ability of the sloshing liquid, tuned sloshing dampers (TSDs), also known as tuned liquid dampers (TLDs) are nowadays being used as structural vibration control devices. The floor plan, geometric requirements, and space constraints create unavoidable problems when installing regular-shaped TLDs. The present study numerically investigates the dynamic response of the sloped wall TLD to verify its vibration control efficiency under harmonic and seismic excitations. The vibration control efficiency is examined for both single- and multi-degree-of-freedom structures. The numerical modeling of the structure-TLD system is done by combining the FEM model for liquid sloshing and the spring-mass model for the structural response. Both elastic and elastoplastic spring-mass models are used for the simulation of linear and non-linear structural response, respectively.