

REPORT ON GUEST LECTURE

“Seismic Design Considerations for Bridges”

1 September 2026 | 2:30 PM – 3:30 PM

Resource Person	Dr. Suhasini Madhekar
Designation	Former Professor of Applied Mechanics, College of Engineering Pune; Chairperson, ISET Pune Chapter
Topic	Seismic Design Considerations for Bridges
Participants	M.Tech Structural Engineering students
Duration	2:30 PM – 3:30 PM
Organised By	Prof. Ankit Asher

Overview

A guest lecture on “Seismic Design Considerations for Bridges” was organised by Prof. Ankit Asher and conducted on 1 September 2026 for the M.Tech Structural Engineering students. The lecture was delivered by Dr. Suhasini Madhekar, Former Professor of Applied Mechanics, College of Engineering Pune and Chairperson of the ISET Pune Chapter. Dr. Madhekar is an alumna of SPCE, having passed out in 1984. The one-hour session focused on the seismic behaviour, vulnerability, design considerations and earthquake-resistant features of bridge structures.

Key Topics Covered

- Bridge components and their seismic role, including foundations, substructures, bearings/connections and superstructures.
- Seismic vulnerability of bridges as lifeline structures, including the consequences of bridge collapse on transportation, relief and rehabilitation operations.
- Observed earthquake-induced failures of superstructures, bearings, piers, abutments and foundations, illustrated through case studies from major earthquakes.
- Capacity design principles, with emphasis on ductile detailing of piers and ensuring flexural failure precedes brittle shear failure.
- Importance of seismic restrainers, stoppers, elastomeric pads and other measures for preventing dislodgement and controlling seismic response.
- Soil-related hazards, including liquefaction and lateral spreading, and their effects on bridge foundations and abutments.
- Indian seismic provisions for bridges, including IS 1893 (Part 3), IRC:SP:114 and RDSO guidelines for railway bridges.
- Energy dissipation and seismic isolation of bridges, including the role of isolators and Shock Transmitting Units (STUs).
- Examples of seismic design features in iconic Indian bridges such as the Dhola-Sadiya Bridge, Bogibeel Bridge, Atal Setu and Chenab River Bridge.
- Potential research topics for PG students in the area of seismic design and retrofitting of bridges.

Important Design Takeaways

The lecture highlighted the importance of adopting a deliberate seismic design philosophy rather than relying only on conventional strength design. Particular attention was drawn to ductile and well-confined piers, adequate bearing seats, continuity and redundancy in the superstructure, suitable foundation systems in liquefiable soils, and effective seismic restrainers and isolation systems. The concluding

discussion emphasized that regular bridge configurations are preferable; the presentation specifically noted that skew angles greater than 30° are undesirable, highly curved interchange geometry should be avoided, and integral bridges up to 60 m span without bearings and expansion joints can be advantageous.

Case Studies and Contemporary Examples

Real earthquake damage was used to connect structural design concepts with observed performance. Examples included bridge failures and damage associated with the Kobe, Northridge, Loma Prieta, Niigata, Guatemala, Costa Rica, Garhwal and Indian earthquakes. Contemporary Indian examples demonstrated how seismic isolation, restrainers, ductile detailing and structural health monitoring can be incorporated into major bridge projects.

Outcome of the Lecture

The lecture provided the students with a practical understanding of earthquake-induced bridge failures and the measures available to improve seismic resilience. The use of actual damage photographs, design concepts and examples of major Indian bridges helped bridge the gap between theoretical seismic design principles and their application in structural engineering practice. Students were also motivated to learn about industry practices in seismic design of bridges.

Photographs



Group photograph of Dr. Suhasini Madhekar with faculty and M.Tech Structural Engineering students.



Dr. Suhasini Madhekar delivering the guest lecture on seismic design considerations for bridges.