

# RECENT ADVANCES IN STRUCTURAL DYNAMICS FOR PROTECTION OF BRIDGES AGAINST EXTREME HAZARADS

## Overview

Recent instances of extreme hazards, such as earthquakes, hurricanes (typhoons), vehicular and blast loads on bridges and other structures have demonstrated the significant role that structural dynamics plays in the analysis and design of physical infrastructures. There have been numerous advances in the area of structural dynamics to deal with these hazards. Examples of these advances include the development of advanced and intelligent protective systems to mitigate damages during these events and development of advanced analytical tools, such as explicit finite element modeling using LS-DYNA and development of constitutive material models to predict nonlinear behavior of structures up to the limit of collapse. These advances have facilitated the analysis and design of structures, particularly bridges, to improve their safety and resiliency during these extreme hazards. The primary objectives and focus of this course are to educate participants, including engineers and researchers, particularly young researchers with potential to engage in cutting edge research, in advances in structural dynamics for bridges, while focusing on fundamental concepts.

## Objectives

The primary objectives of the course are as follows:

- i) Educating participants to the fundamentals of structural dynamics and dynamical behavior of bridges during extreme hazards.
- ii) Building in confidence and capability amongst the participants in the analysis and design of bridges under seismic and other extreme hazards through the integration of research components in structural dynamics concepts.
- iii) Providing exposure to causes of failure of bridges through case studies.
- iv) Enhancing the capability of the participants to understand challenges involved in the analysis of bridges subject to extreme hazard conditions.

<b>Modules</b>	<p>Fundamentals of Structural Dynamics and Bridge Engineering, Behaviour of bridges under hazardous conditions, effectiveness of different seismic protective systems for bridges, Seismic Analysis of Bridges including pushover analysis, Smart protective systems for bridges, Vehicular impacts on bridges, Blast load effects on bridges and current design guidelines for the design of bridges.</p> <p><b>Duration:</b> 1<sup>st</sup> November to 5<sup>th</sup> November 2017 (5 days) : 10 hrs Lectures and 10 hrs Tutorials</p> <p><b>Venue:</b> Seminar Hall, Department of Civil Engineering, IIT (BHU) Varanasi</p> <p style="text-align: center;"><i>Number of participants for the course will be limited to fifty.</i></p>
<b>You Should Attend If...</b>	<ul style="list-style-type: none"> <li>▪ Engineers and Researchers involved in Analysis, Design and Construction of Bridges, Bridge Engineers from public and government organizations including R&amp;D laboratories.</li> <li>▪ Faculty from reputed institutions and Students at all levels working in relevant area</li> </ul>
<b>Fees</b>	<p>The participation fees for taking the course is as follows:</p> <p><b>Participants from abroad : US \$500</b></p> <p><b>Industry/ Research Organizations: Rs 8000/-per participants</b></p> <p><b>Academic Institutions: Rs 4000/- per participants</b></p> <p><b>M. Tech and Ph. D. students Rs 1500/- per participants</b></p> <p><b>UG students Rs 500/- per participants</b></p> <p>The above fee includes all instructional materials, computer use for tutorials and assignments, laboratory equipment usage charges. The participants will be provided accommodation on payment basis.</p>

## The Faculty



**Dr. Anil Agrawal** is currently a Professor of Civil Engineering at the City College of the City University of New York, New York. He joined the City College of the City University of New York, New York in September 1998. He received his Ph.D. in Civil Engineering from the University of California, Irvine, in August 1997, M.Eng. from the University of Tokyo, Japan in 1991 and B. Tech. in Civil Engineering from IIT Kanpur. Dr. Agrawal is a licensed professional engineer in New York since July 2001. He is currently Chief Editor of the ASCE Journal of Bridge Engineering, past-chair of ASCE Committee on Bridge Inspection, Rehabilitation and Monitoring and the past chair of ASCE Committee on Structural Control and Sensing. He is also the president of US Panel of International Association of Structural Control and Monitoring. His areas of research include structural response control, seismic risk assessment of bridges, blast and vehicular impact loads on bridges, and safety of long span bridges.



**Dr. P. R. Maiti** is currently working as Associate professor in Department of Civil Engineering, Indian Institute of Technology (Banaras Hindu University) Varanasi. He has 13 years teaching experience in undergraduate and postgraduate level and guided many masters and Ph. D. students. His major areas of research and teaching interest are: Steel Structures, Structural Dynamics and Bridge Engineering. Besides these, he works in the field of fluid-structure interaction particularly fluid flow around slender structures such as bridge piers. He has executed several consultancy projects in structural Engineering.

## Course Coordinator

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