

COLLEGE OF ENGINEERING PUNE  
(COEP), Pune



सत्यमेव जयते

MINISTRY OF HUMAN RESOURCE AND DEVELOPMENT  
Government of India

**Gian**

GLOBAL INITIATIVE OF ACADEMIC NETWORKS

## Advanced Structural Dynamics

24<sup>th</sup> to 28<sup>th</sup> December, 2018

### College of Engineering Pune

(An autonomous institute of Govt. of Maharashtra, Maharashtra State, India)

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## About COEP

College of Engineering Pune (COEP), chartered in 1854 is a nationally respected leader in technical education. The institute is distinguished by its commitment to finding solutions to the great predicaments of the day through advanced technology. The institute has a rich history and dedication to the pursuit of excellence. COEP is a top-tier Institute in India that boasts a 164 year culture of academic excellence, scientific breakthroughs, and high-tech innovation. It is an autonomous engineering institute affiliated to Savitribai Phule Pune University (SPPU) in Pune, Maharashtra, India.

COEP offers a unique learning experience across a spectrum of academic and social experiences. With a firm footing in truth and humanity, the institute gives an understanding of both, technical developments and the ethics that go with it. The hallmark of COEP education is its strong and widespread alumni network, support of the industry and the camaraderie that the institute shares with several foreign universities. The institute is consistently ranked high amongst the top technical colleges in India. The credit for most of the civil infrastructure in India goes to the alumni of this college, starting from none other than the most towering and illustrious engineers, **Bharat Ratna Sir M. Visvesvarayya**, in whose honour, “Engineers Day” is celebrated.

The Institute is reputed for excellent teaching and training in Engineering and Technology at Degree, Post Graduate levels and for Research. Today, COEP offers nine UG and twenty three PG programmes, and has more than 3500 students enrolled in its various courses. Since the time of inception, COEP has been playing a vital role in producing quality Engineers, introducing new programmes, and electives in the emerging areas.

### Patron

**Prof. B. B. Ahuja**  
Director, COEP, Pune

### International Expert

**Prof. Mihailo D. Trifunac**  
Department of Civil and Environmental  
Engineering  
University of Southern California  
Los Angeles, USA

### Host Expert

**Prof. Ishwer D. Gupta**  
Former Director  
Central Water and Power Research  
Station (CWPRS)  
Pune

### Head of the Department

**Prof. Sukhanand S. Bhosale**  
Professor of Civil Engineering  
Department Civil Engineering  
COEP, Pune

### Course Coordinator

**Dr. Suhasini N. Madhekar**  
Associate Professor, Applied Mechanics  
Department Civil Engineering  
COEP, Pune

## Overview

Although the subject of structural dynamics has a long history, the last few decades have seen a remarkable development of numerical methods and advanced numerical techniques for dynamic analysis of structures. Structures are very often subjected to dynamic loads such as wind, earthquake, machine vibration and wave loading. Engineers should be fully aware of the causes of vibration and the way in which the structures respond to dynamic loading. The intention in organising the GIAN course on “**Advanced Structural Dynamics**” is to provide a review of modern numerical procedures for structural dynamics and to illustrate their use by application to significant practical problems. This course will focus on the theoretical and the practical aspects of structural dynamics, random vibrations and structural health monitoring.

The course will begin from the basics of single degree of freedom systems and take the attendees through complex multiple degree of freedom systems and continuous systems. The course will cover techniques for dynamic response in the frequency domain as well as methods for transient response by time integration. Some part of the course will be devoted to detailed presentations of practical applications, covering a wide range of situations, including soil structure interaction and fluid-structure interaction.

The concept structural health monitoring (SHM) has been receiving considerable attention worldwide as well as in India. SHM enables prompt identification and localization of damage before it attains serious level. This course has been especially designed to cover the basic concepts and application of SHM based on the principles of structural dynamics.

## Course Objectives

The primary objectives of the course are as follows:

1. To expose the participants to the fundamentals of structural dynamics
2. To build capability amongst the participants in the application of structural dynamics concepts and numerical techniques to solve real-life problems
3. To provide exposure to practical problems and their solutions, through case studies
4. To expose the participants to the programming techniques
5. To learn application of SHM based on the principles of structural dynamics

International Expert

**Prof. Mihailo D. Trifunac**



Professor

Civil & Environmental Engineering Department  
University of Southern California  
Los Angeles

URL: [www.usc.edu/dept/civil\\_eng/Earthquake\\_eng/](http://www.usc.edu/dept/civil_eng/Earthquake_eng/)

Professor Mihailo Trifunac is one of the leading experts in earthquake engineering and engineering seismology, worldwide. He has conducted both; theoretical and experimental work on a variety of topics including: earthquake source mechanism, empirical scaling of strong ground motion, strong motion arrays deployment, seismic wave propagation and site effects on strong ground motion, seismic hazard assessment, structural dynamics and soil-structure interaction, full-scale testing of structures, seismic instrumentation and data processing, statistics of earthquake response, and tsunami research. He is an author or co-author of nearly 500 technical publications and his work is widely cited. He has published 4 book chapters.

Prof. Trifunac has received the ‘Kapitsa Gold Medal’, to author of scientific discovery in 2002 from the Russian Academy of Natural Sciences and, several prestigious awards for outstanding contributions and services in the field of Earthquake Engineering & Engineering Seismology and structural dynamics, from different countries. He has been named among *Top 20 Authors on the Special Topic – Earthquakes* worldwide for the period 1993-2003 (one of only two earthquake engineers on this lists), and among *Top 1% Authors in Engineering* worldwide by the Institute of Scientific Information (Thompson ISI).

In 2012 he was *ranked by Microsoft Academic Search* among the top authors (All years); in Civil Engineering (12<sup>th</sup>), Mechanical Engineering (46<sup>th</sup>), Seismology (1<sup>st</sup>), and Reliability and Risk (1<sup>st</sup>). He is a member of American Geophysical Union (AGU), American Society of Civil Engineers (ASCE), Seismological Society of America (SSA), Earthquake Engineering Research Institute (EERI), Indian Society of Earthquake Technology (ISET), and New York Academy of Sciences.

Host Faculty

**Prof. Ishwer D. Gupta**



Former Director of Central Water and Power Research Station, Pune

Dr. Ishwer Datt Gupta is a well-known expert in earthquake engineering and engineering seismology, in the country and abroad. Major research areas of his expertise include: probabilistic seismic hazard analysis, seismic zoning, stochastic structural dynamics, seismic response analysis of gravity dams, seismic surveillance of river valley projects, reservoir triggered seismicity, strong ground motion characterization, and controlled blasting at civil engineering construction sites. He is author or co-author of 125 technical papers, six state-of-the-art research reports, and nearly 200 reports on project specific studies.

Dr. Gupta worked at CWPRS for 34 years after joining as Research Officer in 1979. Having worked in different capacities as Senior Research Officer, Chief Research Officer, Joint Director and Additional Director, he retired as Director of CWPRS in August 2009. Dr. Gupta took the leading role in preparation of the guidelines “Site Specific Seismic Study of River Valley Projects” for National Committee on Seismic Design Parameters (NCSDP), CWC New Delhi. He has made important contributions in updating the seismic zoning map of India as member of the BIS committee. Dr. Gupta has been instrumental in formulating the guidelines “Beyond Design Basis Earthquake Forces for Indian Nuclear Power Plants” as member of an Expert Group setup by AERB, Mumbai, as an aftermath of the Fukushima Disaster.

Dr. Gupta is in the Editorial Board of ISET Journal of Earthquake Engineering and International Journal of Geotechnical Earthquake Engineering. He has been the recipient of ISET best paper award in Seismology in 1986, Hanumantacharya Joshi award for the ISET best paper in Structural Dynamics and Golden Jubilee Award for outstanding contribution to R&D in Civil Engineering by the Indian Mining & Engineering (IME) Journal in 2012. He was an invited visiting scholar to University of Southern California, USA, to participate in basic research project “Seismic Risk Studies in Structural Dynamics”. He is also invited as visiting faculty at IIT Roorkee.

## Head of Civil Engineering Department

**Prof. Sukhanand S. Bhosale**



The department of Civil Engineering established in 1854 has the distinction of being the oldest department in the institute. It has set up a great tradition of producing distinguished engineers such as Bharat Ratna late Sir. M. Visvesvarayya who through his countless works is synonymous with Civil engineering. Even after completing its sesquicentennial anniversary, the department has kept updating to well-equipped laboratories and research. The department is proud to have a Plumbing laboratory which is one of its kinds in an engineering institute, in addition to the conventional laboratories. The faculty believes in high quality teaching and is very active in projects, conferences and research papers. The department offers consultancy in various fields of Civil engineering to reputed government and private sectors. PhD in Civil engineering is offered by the Department, along with M. Tech in Construction Management, Environmental and Water Resource, Geotechnical Engineering and Structural Engineering.

### Course Coordinator

**Dr. Suhasini N. Madhekar**



Dr. Suhasini Madhekar is PhD from Indian Institute of Technology (IIT) Bombay. Her research interests include Structural Dynamics and Vibration Control, Bridge Engineering and protection of structures from earthquake. She has published a book on “Seismic design of RC buildings - Theory and Practice”, co-authored by Mr. Sharad Manohar. The book is of international repute, published by Springer. It received award from Association of Consulting Civil Engineers, India, the ACCE (I) - Nagadi award as ‘Best Publication of the year 2017- useful to structural consultants’. Dr. Madhekar has organised several seminars, workshops and conferences and, delivered invited lectures in educational institutes all over India. She is reviewer of international journals and has authored international journal papers and book chapters. She is recipient of the Excellence in Teaching Award the ‘COEP Star Award’, by COEP and the ‘Alumni Distinguished Faculty Fellow’- research fellowship, by Alumni Association of College of Engineering Pune.

<b>Duration of Course</b>	24 <sup>th</sup> December to 28 <sup>th</sup> December 2018
<b>Modules</b>	<p><b>Day 1:</b></p> <ul style="list-style-type: none"> <li>• Introduction to structural dynamics, SDOF, MODF and continuous systems</li> <li>• Response to general dynamic loading and harmonic loading</li> <li>• Assignment 1 : Problems based on above lectures</li> </ul> <p><b>Day 2:</b></p> <ul style="list-style-type: none"> <li>• Modelling of structures for linear and nonlinear response, Time history and Frequency domain analyses</li> <li>• Characterization of strong ground motion, Inelastic response spectra</li> <li>• Assignment 2 : Problems based on above lectures</li> </ul> <p><b>Day 3:</b></p> <ul style="list-style-type: none"> <li>• Ground Motion Attenuation Relations, Estimation of design ground motion</li> <li>• Structural vibration monitoring and dynamic response analysis</li> <li>• Assignment 3 : Problems based on above lectures</li> </ul> <p><b>Day 4:</b></p> <ul style="list-style-type: none"> <li>• Introduction to Random Vibration and Stochastic Analysis</li> <li>• Random Vibration Application to Structural Response</li> <li>• Soil-structure and Fluid structure Interactions</li> <li>• Assignment 4: MATLAB programs</li> </ul> <p><b>Day 5:</b></p> <ul style="list-style-type: none"> <li>• Ambient vibration testing method and Structural Health Monitoring.</li> <li>• Summary, discussion and future research</li> <li>• Assignment 5: MATLAB programs</li> <li>• Examination based on the entire course content</li> </ul>

<p><b>The course is for..</b></p>	<ul style="list-style-type: none"> <li>• Civil and Mechanical Engineering Faculty from academic institutions and technical institutions.</li> <li>• Researchers and practicing engineers engaged in the development and use of numerical techniques for dynamic analysis of structures.</li> <li>• Executives and engineers from service and government organizations including R&amp;D laboratories.</li> <li>• Students (M. Tech) and research scholars from Civil and Mechanical Engineering departments</li> <li>• Research scientists interested in designing structures / machines subjected to dynamic loading</li> </ul>
<p><b>Registration Fees</b></p>	<p>The participation fees for taking the course is as follows:</p> <ul style="list-style-type: none"> <li>• Participants from abroad: US \$250</li> <li>• Industry/ Research Organizations: Rs. 7500/-</li> <li>• Faculties from Academic Institutions: Rs. 5000/-</li> <li>• Research Scholars/PG Students: Rs. 2000/-</li> </ul> <p>The above fee includes instructional materials, internet facility, Breakfast and Lunch.</p> <p>Number of participants for the course is limited to Fifty (50)</p>

**Guidelines for  
Registration**

**Step 1**

Register online at GIAN portal <http://www.gian.iitkgp.ac.in/> by paying one-time registration fee. Registration to the portal is one time affair and will be valid for lifetime for any GIAN courses. Once registered in the portal, an applicant will be able to apply for any number of GIAN courses as and when necessary. One time Non-refundable fee of Rs. 500/- is charged for this service. Please also note that mere registration to the portal will not ensure participation in the courses. Please do not confuse between web registration with course registration. The course registration fee is separate.

**Step 2**

After registering to the GIAN portal, login to the portal and register for the course by selecting the course on **Advanced Structural Dynamics**

**Step 3: Payment Procedure and Confirmation**

Payment of registration fees can be made via Demand Draft or RTGS/NEFT.

- Demand Draft should be drawn in favour of "Director, College of Engineering Pune", payable at Pune.

- For RTGS/ NEFT payment, details are as below:

Bank account holder's Name: Director College of Engineering Pune

Bank account number (for NEFT/RTGS/E-payments): 11099464977

Bank IFSC Code number : SBIN0010431

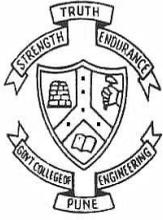
Bank MICR Code number : 411002060

Bank Code number : 10431

Name of Bank : State Bank of India

Address of Bank : Wellesley Road, Shivajinagar, Pune 411 005

For the confirmation of registration, the proof of payment (a scanned copy of the Demand Draft/ NEFT/RTGS transaction confirmation details) along with the registration form and copy of PDF generated at GIAN portal are to be emailed to : [snm.civil@coep.ac.in](mailto:snm.civil@coep.ac.in) or before 10/12/2018. Also please email your UTR number (after payment is done) and your name. Hard copies of the above documents have to be submitted in person on the first day of the course. For any query, contact the course Coordinator.



College of Engineering Pune (COEP), Pune  
One Week GIAN  
Course on

## “Advanced Structural Dynamics”

24<sup>th</sup> to 28<sup>th</sup> December 2018

### Registration Form

Paste  
Photo  
Here

Participant's Name	
GIAN Registration Number (Mandatory)	
Date of Birth (DD/MM/YYYY)	
Gender (Male/Female)	
Name of Institute/Organization/ Industry	
Current Designation / Status	
Qualification	
E-mail Id	
Contact Mobile Number	
Address for correspondence	
Participant's signature	
Name of Sponsoring Authority (Director/Head of Institute /Principal /HOD)	
Signature of sponsoring authority with seal and date	

- Send the scan copy of registration form via email to [snm.civil@coep.ac.in](mailto:snm.civil@coep.ac.in)
- After you receive the approval email send the hard copy of registration form with Demand draft to the course coordinator
- Dr. Suhasini N. Madhekar  
Associate Professor, Applied Mechanics  
Department of Civil Engineering,  
College of Engineering Pune, Wellesley Road,  
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