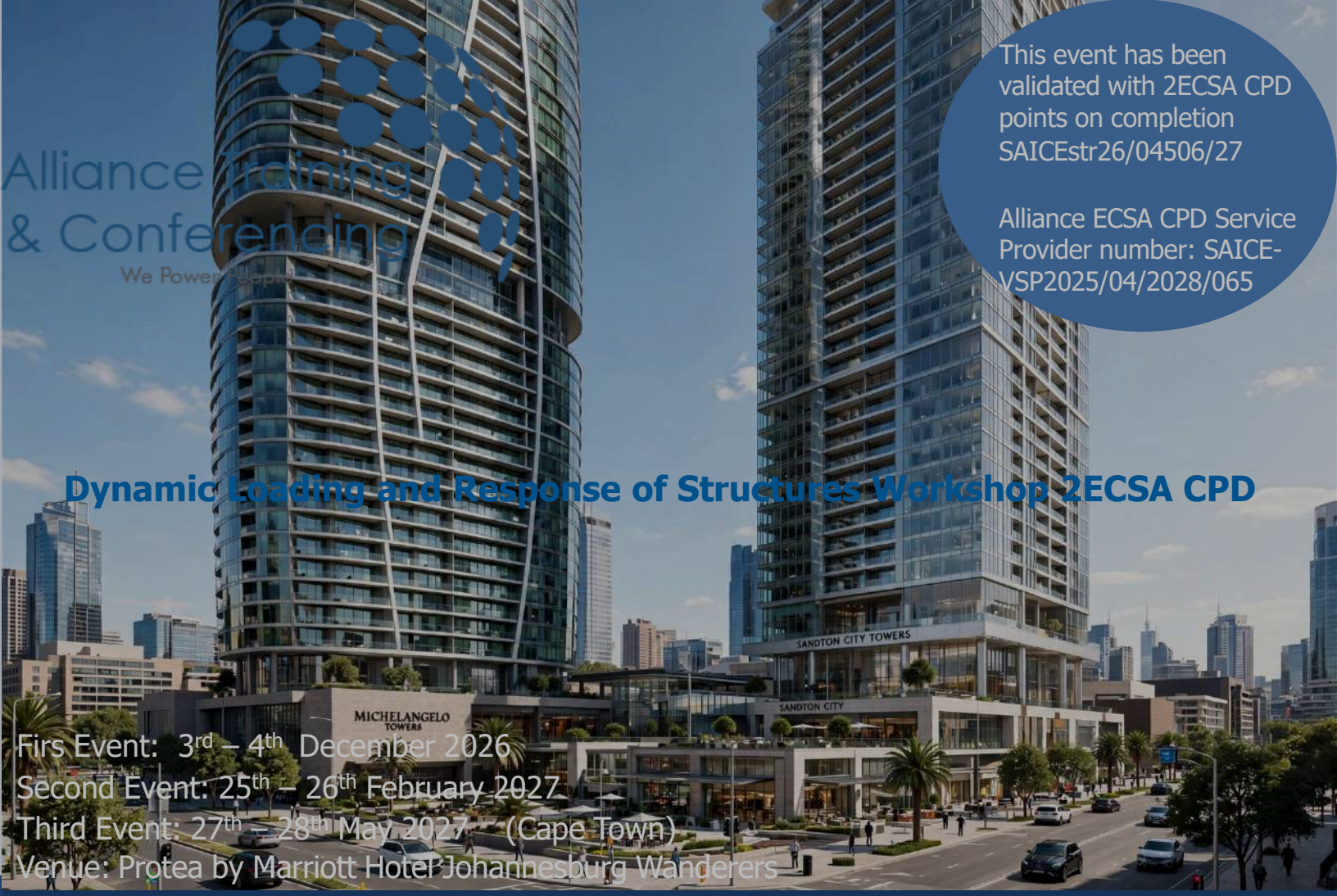


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This event has been validated with 2ECSA CPD points on completion SAICEstr26/04506/27

Alliance ECSA CPD Service Provider number: SAICE-VSP2025/04/2028/065

Dynamic Loading and Response of Structures Workshop 2ECSA CPD

Firs Event: 3rd – 4th December 2026
Second Event: 25th – 26th February 2027
Third Event: 27th – 28th May 2027 (Cape Town)
Venue: Protea by Marriott Hotel Johannesburg Wanderers

Workshop Overview

How does dynamic loading affect the stress analysis of your structures?

This two-day workshop is aimed at transferring knowledge and skills to civil and structural engineers on the fundamentals and practical applications of structural dynamics analysis techniques in support of the design of structures to withstand rare dynamic actions including that of an earthquake. Focus of this two-day training workshop will be to cover topics such as single degree of freedom systems, forced vibration, multi-degree of freedom systems and the design of reciprocating foundations, taking into consideration standards and codes applicable.

- Gaining Insight into the issues associated with load assessment
- Design concentrating on wind and wave loading effects on structures
- Gaining insight into seismic design codes
- Vibrations and impacts on engineering structures
- Analytical Dynamics
- Regulations and standards
- Single and Multi-Degree of Freedom Systems
- Response analysis and factors that must be addressed in developing a successful

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+27(0)10 023 3396 info@alliancetc.co.za www.alliancetc.co.za

Our experienced facilitator



Prof. Jeffrey Mahachi

Prof Jeffrey Mahachi is Director at the Sustainable Materials and Construction Technologies Research Centre, University of Johannesburg, and a former Head of the School of Civil Engineering and the Built Environment. A registered professional engineer (PrEng) and construction project manager (Pr.CPM), he holds a PhD in Civil Engineering (Wits). He is a Fellow of the South African Institution of Civil Engineering (FSAICE). Prof Mahachi has extensive executive experience, including senior roles at the National Home Builders Registration Council and the CSIR. His research focuses on disruptive construction technologies, structural risks, and Construction 3D Printing, supported by funding from the Department of Science, Technology and Innovation. He has served as Board Chair of Agrément South Africa and as a Technical Committee member of the Council for Geo Science. A prolific author, he has contributed widely to engineering literature and continues to advance innovation and excellence in Civil Engineering and the Built Environment.

Delegate Note:

Many engineers have plenty of exposure to dynamics as a topic of some importance through the computer software they have purchased and use, presentations they attend in technical seminars and conversations they have with specialists. The subject matter of dynamic loading and response of structures is seldom well understood. Few engineers have the time to go through textbooks in a systematic manner, and this is especially the case for the more senior members of the profession who have been out of university for a long time. This two-day workshop is aimed at giving a technical discussion in dynamic analysis and design. The objective is to review fundamental concepts, analysis techniques and rules-of-thumb to eliminate structural problems.

It will equip the engineer with knowledge of structural dynamics for problems most frequently encountered in the structural engineering field. The focus of this two-day training workshop will be to cover topics such as single degree of freedom systems, forced vibration, multi-degree of freedom systems and the design of reciprocating foundations, taking into consideration standards and codes applicable. Experienced professional engineers who are in a supervisory position, and are responsible for the design, or construction of a structure, normally experience difficulties when it comes to reviewing results of structural dynamic analyses obtained by (usually)more junior members of the design team as it is often unclear what results they are to expect.

Who Should Attend?

- Civil Engineers who are engaged in the design or assessment of structures.
- Structural Engineers who are engaged in the design or assessment of structures.
- Engineering professionals working in government departments
- Engineering professionals working in local councils
- Developers and owners of infrastructure
- Graduate students involved in the study of, or research into, the performance and design of structural systems subjected to dynamic loading would also benefit from this workshop.

Core Organizational Benefits:

- **Failure Prevention:** Training helps engineers identify vulnerable areas prone to failure during earthquakes, windstorms, or other sudden loads.
- **Accurate Modeling:** Organizations can better manage complex dynamic conditions like vibrations from machinery (pumps, rotating equipment) and human-induced floor vibrations, preventing long-term fatigue or resonance issues.
- **Reduced Overdesign:** Understanding dynamic behavior allows engineers to avoid conservative "overdesign," leading to efficient material use without compromising safety.
- **Early Issue Detection:** Identifying potential dynamic problems during the design phase—rather than after construction—prevents costly redesigns and delays.
- **Employee Value:** Investing in high-level technical training improves job satisfaction and retention, particularly among younger engineers who value skill development and career progression.
- **Knowledge Transfer:** Workshops often target senior engineers who may have been out of university for some time, bridging the gap between their experience and modern computational techniques.

Core Individual Benefits:

- **Career Advancement:** Mastering complex analysis techniques like seismic and wind loading positions you as a "future-ready" professional, increasing your value to employers and clients.
- **Design Confidence:** You develop the ability to confidently "defend and revise" structural decisions when presented to peers or approval authorities.
- **Advanced Modeling Mastery:** Learn to model Single Degree of Freedom (SDOF) and Multi-Degree of Freedom (MDOF) systems using time-varying characteristics rather than simplified static equilibrium.
- **Risk Mitigation Skills:** Gain the ability to identify "weak points" in designs prone to failure during extreme events like earthquakes, windstorms, or blasts.
- **Design Optimization:** Learn to optimize structural shapes and material quantities to minimize vibrations and aerodynamic drag without overdesigning, which saves both time and costs.

Course Outline:

An overview of structural Dynamics

- Design considerations for dynamic loads
- Converting dynamic loads to equivalent static loads.
- A brief overview on the practical application of dynamic loads and how they can be simplified.
- Identifying different types of dynamic loads on different types of structures.
- Gaining insight into structural dynamics.
- Elaborating on human response during dynamics.

Single and Multi-Degree of Freedom Systems

- Multi-degree of freedom systems.
- Single degree of freedom systems with excitation forces
- The determination of equivalent stiffness systems.
- The equation of motion.
- Natural frequencies of structural systems

Wind Loads on Structures

- Discussing different methods for approximating wind periods
- Gaining insight into gust factors
- Considering dynamic effects
- Gaining insight into dynamically sensitive buildings
- Discussing dynamic response of slender structures under wind loads
- Examining design considerations for wind loads
- Performing dynamic analysis simulated wind histories
- Testing for dynamic response due to wind loads
- A holistic approach to dynamic analysis for winds
- Incorporating damping when analyzing wind loads

Seismic Loads On Structures:

- Determining seismic period
- Gaining insight into seismic design codes
- Design considerations for seismic loads incorporating
  - Linear dynamic analysis
  - Non-linear static analysis
  - Non-linear dynamic analysis
- Technical geometry of structural stability for dynamic loads
- Examining the earthquake response spectrum on structures
- Understanding load take-down and its relevance
- Overseeing load reductions in structures
- Elaborating on structural resonance

Regulations and Standards

- Discussing applicable regulations and standards for structural dynamics
- SANS codes
- Gaining insight into other seismic codes
- Implementing recent amendments to the wind loading codes

Damping Properties of Vibrating Structures

- Evaluating the effects of damping on structures
- Understanding damping properties
- Identifying damping types through collected data
- Locating damping elements from structures

- Estimating the damping matrix
- Gaining insight into numerical assessment of damping property investigation

Analytical Dynamics
- Gaining insight into different forms of Finite Element Analysis models
- Evaluating structural connectivity in an analytical model
- Locating mis-modelled regions in an analytical model
- Improving analytical models
- Discussing compatibility of measured models and analytical models
- Applying modeling error location to a real structure

Vibrations and Impacts on Engineering Structures:
- Vibration limitations
- Understanding limits to vibrations (how much is acceptable)
- Dynamic magnification factors
- Resonance
- Frequency ratios and design limitations
- Out-of-balance forces of machines
- Eigen values and Eigenvectors
- Design examples

Foundation Design for Vibrating Machinery
- Interpreting equipment vibrations
- Empirical design rules
- Dynamic E
- Sub grade reactions
- Natural frequency calculations
- Amplitudes of vibration
- Limitations on amplitudes
- Design examples

Please Note:

- A copy of South African ID/ Passport is required for CPD certification.
- Bringing along your laptop/notebook computer is encouraged but not essential.
- You gain skills in high demand for specialized roles such as Structural Analyst or Consulting Engineer
- Stay current with recent amendments to international codes, such as wind loading and seismic design standards.
- Our workshops often use case studies involving modern challenges like pedestrian-induced vibrations on bridges or foundation design for reciprocating machinery.

Dynamic Loading and Response of Structures Workshop 2CPD Points SAICEstr26/04506/27

Registration Form
Please write in BLOCK CAPITALS

Alliance Training & Conferencing
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Company & Delegates Details

Att: Lethu info@alliancetc.co.za

Company name: _____

Business Address: _____

_____

Vat: _____

City: _____ Postal Code: _____

_____ Fax: _____

First Event Date: 3rd – 4th December 2026
☐ Virtual ☐ In-person
Protea by Marriott Hotel Johannesburg Wanderers

Second Event Date: 25th – 26th February 2027
☐ Virtual ☐ In-person
Protea by Marriott Hotel Johannesburg Wanderers

Third Event Date: 27th – 28th May 2027
☐ Virtual ☐ In-person
Radisson Blue Le Vendome Hotel Cape Town

Delegate Details:

1.First Names _____
Position: _____
Email: _____

2.First Names: _____
Position: _____
Email: _____

3.First Names: _____
Position: _____
Email: _____

4.First Names: _____
Position: _____
Email: _____

5.First Names: _____
Position: _____
Email: _____

Price per Delegate: R10 499.99
Virtual Price: R8 999.99
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Free accommodation for the 6th delegate when you book 5 (excluding dinner)

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Authorization

Signatory must be authorized to sign on behalf of the contracting Organization:

First Name: _____
Position: _____
Email Address: _____
Signature: _____
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