



# SEISMIC DESIGN OF BUILDING STRUCTURES

## On Line Course via Zoom

Seismic Design **5 days – Early bird registration**

**Stellenbosch University – On Line**

8 November – 12 November 2021

**5 CPD Credits**

**R 10 800 Early bird**

**(Price includes VAT)**

**Register by 22 October 2021**

Seismic Design **5 days – Normal registration**

**Stellenbosch University – On Line**

8 November - 12 November 2021

**5 CPD Credits**

**R 12 000 – Normal bird**

**(Price includes VAT)**

**Register by 3 November 2021**

## COURSE OBJECTIVES

Certain areas in South Africa have been identified by the Structural Loading Code as regions where buildings need to be designed for seismic loads. The aim of this course is to present the principles for the design and layout of structures subjected to seismic loads. The emphasis will be placed on design of reinforced concrete structures in areas of natural seismicity. The course presented in Johannesburg will also deal with spectra for and design considerations against the effects of mining-induced tremors.

As long as some basic principles are adhered to, structures designed for moderate seismic loads need not be more expensive than others. Although the course will require participants to apply their minds to the theoretical background of seismic design, participants will be rewarded with a comprehension of the practical requirements and details to achieve seismic resistant structures.

The course will provide the background to seismic activity and the effects on buildings. Ductile element and material behaviour forms an integral part of the behaviour of buildings subject to seismic loads. The effect on building response as well as methods to achieve ductile behaviour will be addressed. The course will provide the theoretical background for and the application of design methods, including principles to be considered during conceptual design.

A document introducing the engineering seismology of South Africa will be emailed to delegates before the course commences for reference and background reading prior to the course.

The course is recommended for structural engineers, who are involved in the design of building structures in areas of seismicity. Both practicing engineers and postgraduate students will benefit from the course.

The course may be completed for non-degree purposes, or as part of the Master's Degree programme at the University of Stellenbosch.

The course is also suitable for CPD purposes for practicing engineers, technologists and technicians.

# COURSE FORMAT, RESOURCES AND PARTICIPATION REQUIREMENTS

## Technical requirements for participants

Students and other participants attending this course will need a suitable internet link to access the content

## Course Format

The course will be presented using a selected combination of live video conferencing sessions, recorded video material as well as documents made available on line.

The programme schedule is supplied as a guideline only. Presenters can elect to switch between live video, static video as well as guided reading and exercise sessions as required by the course material.

## Course delivery resources

The live video conferencing content for the course will be presented using the Zoom video conferencing platform.

Course material including notes, presentation slides, video recordings and tutorial questions will be made available via the web based content delivery platforms of the university i.e. <http://learn.sun.ac.za> for academic students and <http://online.sun.ac.za> for CPD candidates.

Students which do not have suitable internet connection infrastructure will be able to attend the course in a small conference room facility at the offices of the department of civil engineering at the Decanting Building on Hammanshand road. Limited seats are available. Please contact the course administrator if you need to make use of this facility.

## Participation and attendance verification requirements

**Participants completing the course for CPD purposes as well as students participating for attendance only credit will need to complete a selection of on line quizzes to formalise their participation in the on line course.**

Students attending the course for degree purposes will need to submit assignments for evaluation and sit a course exam.

## PRESENTERS



**Dr Ricardo Monteiro (PhD)**

### **University School for Advanced Studies IUSS Pavia - Italy**

Ricardo Monteiro is Associate Professor (effective November 2021) at the University School of Advanced Studies IUSS Pavia, where he is also the Deputy Director of the Understanding and Managing Extremes (UME) Graduate School (formerly ROSE School) and the Coordinator of the Italian (ROSE) and Erasmus Mundus (MEEES) MSc programmes in Earthquake Engineering and Engineering Seismology. He is also Senior Advisor for the European Centre for Training and Research in Earthquake Engineering (EUCENTRE) in Italy and the University of Porto, Portugal.

He has been involved in a number of European Research Projects, such as LESSLOSS, SYNERG-G, NERA, SASPARM, mostly dedicated to the seismic vulnerability assessment of bridges and buildings. Recently he is coordinating research projects on seismic risk in Europe, North Africa and the Middle East (ITERATE and INFRA-NAT). He has been the advisor of over 40 MSc and 8 PhD theses in the field of extreme events and co-authored over 100 scientific publications. He has teaching experience in both Italy and Portugal, where he qualified in Civil Engineering at University of Porto. He then completed his PhD specializing in Earthquake Engineering, with a thesis on Probabilistic Seismic Assessment of RC Bridges.

## PRESENTERS



**Mr Chris Palmer B Sc Eng (Rand); GDE (UCT)**

### **Specialist Consultant – Cape Town**

Chris Palmer is a professional engineer in active retirement. He spent over 2 decades in consulting engineering with Liebenberg & Stander (now Bergstan) – in structural engineering, including high-rise buildings, and project management (industrial projects as principal agent; management committee representative for design consortium for the Mossgas Offshore Gas Production platform), and then as managing partner – before opening his own project management practice in 1994 (projects include Table Mountain aerial cableway upgrade; Study manager for the Southern African Large Telescope at Sutherland; design management Mbombela World Cup soccer stadium and Cape Town domestic terminals) from which he retired a few years ago. Since retirement he developed an e-learning course for retail traders of the financial derivatives markets; completed Oxford University courses (philosophy of science; modern history (Hitler and Stalin) and cosmology and exobiology), as well as assisting consultants with structural work, and with project management assignments.

His interest in earthquake engineering in general was stimulated while completing the designs of water storage tanks and towers subjected to seismic actions (inverted pendulums, dynamic water sloshing). An invitation to join a working group, now under the chairmanship of Professor Roth of Pretoria University, to consider revisions to the current code prompted a period of interactions with staff of the structural department at Stellenbosch University and a critical review that he undertook of the detail of the SANS code, including comparative calculations of designs by SANS and Eurocode 8 requirements.

He currently offers education and training services in earthquake engineering for application in South Africa, and consulting services in the design of seismic resistant buildings.

## PROGRAMME - 5 DAY COURSE (On Line via Zoom)

Date	Lecture Topics
<b>8 November 2021</b>	
<b>08:30 - 09:00</b>	Registration – Testing of connection to on line system
<b>09:00 – 10:00</b>	L1: Introduction L2: Elements of seismology (refer to pre-reading)(Chris Palmer)
<b>10:00 – 10:30</b>	Break
<b>10:30 – 13:00</b>	L3: Force-deformation characteristics of RC elements
<b>13:00 – 14:00</b>	Break
<b>14:00 – 16:00</b>	Tutorial – Homework assignment 1 (HW1) – Part A - Section analysis and design action
<b><u>9 November 2021</u></b>	
<b>09:00 – 10:30</b>	L4: Elastic and inelastic response spectra L4.1: SDOF time-history analysis L4.2: Elastic response spectra
<b>10:30 – 11:00</b>	Break
<b>11:00 – 13:00</b>	L4.3: Strength and ductility L4.4: Inelastic response spectra
<b>13:00 – 14:00</b>	Break
<b>14:00 – 14:30</b>	Euro code 8-1: The South African Nationally Determined Parameters (Chris Palmer)
<b>14:30 – 16:00</b>	Tutorial – Homework assignment 1 (HW1) – Part B - Section analysis and design action
<b>14:00 – 14:30</b>	Eurocode 8-1: Detail requirements for ductile walls (Chris Palmer)
<b>14:30 – 16:00</b>	Tutorial – Homework assignment 2 (HW2) - Building analysis

# SEISMIC DESIGN OF BUILDING STRUCTURES - 2021 PROGRAMME - 5 DAY COURSE (On Line via Zoom)

10 November 2021	
09:00 – 10:30	L5: Seismic design methods L5.1: Introduction to Force based design L5.2: Equivalent lateral force method
10:30 – 11:00	Break
11:00 – 13:00	L5.3: Response spectrum method L5.4: Modal response techniques for irregular building layouts (Chris Palmer)
13:00 – 14:00	Break
11 November 2021	
09:00 – 10:30	L6: Design and detailing of buildings L6.1: Capacity design
10:30 – 11:00	Break
11:00 – 13:00	L6.2: Structural detailing in capacity design L6.3: Comparison of Eurocode and SANS 10160-4. Effects of inherent eccentricity. (Chris Palmer)
13:00 – 14:00	Break
14:00 – 14:30	Design for mine tremor effects (Chris Palmer)
14:30 – 16:00	Tutorial – Homework assignment 3 (HW3) - Design and detail of RC wall
12 November 2021	
09:00 – 10:30	L7: Conceptual seismic design
10:30 – 11:00	Break
11:00 – 13:00	L8: Seismic design methods L8.1: Additional considerations on force based design
13:00 – 14:00	Break
14:00 – 16:00	L8.2: Introduction to Direct displacement-based design

NOTE: For all the topics, reference will be made to Eurocode 2, 8 and SANS10160-4



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## REGISTRATION

### **To register for this course:**

<https://shortcourses.sun.ac.za/application-form.html?offeringid=ac572d17-021b-ec11-abe7-005056801c40>

Please Note: Our system will only generate an invoice for your records if you request an invoice before payment.

## CPD CREDITS

The course is accredited for 5 Continued Professional Development credits with ECSA.

## PAYMENT

**Early Bird:**                      **R10 800**                      Registration & payment must be received by 22 October 2021

**Normal Bird:**                      **R12 000**                      Registration & payment must be received by 3 November 2021

### **PAYMENT INSTRUCTIONS:**

On registering for a course you will receive an automated email featuring our bank details for payment. If you are paying your own registration and do not require an invoice, please use this method.

If however your company is making payment on your behalf and requires an official tax **invoice**, please indicate this on the registration form and wait for the invoice before making payment

### **PLEASE EMAIL PROOF OF PAYMENT TO:**

**Ms. Tsholo Seroalo**

**Email:** [civilcourses@sun.ac.za](mailto:civilcourses@sun.ac.za)

**Enquiries:** 021 808 4131

## WE ARE LOOKING FORWARD TO WELCOMING YOU AT THIS COURSE



